CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/11
Paper 11 (Core)

Key Messages

To succeed in this paper, candidates need to have covered the full Core syllabus, be able to apply formulae, show all necessary working clearly and check their answers for sense and accuracy.

General Comments

Workings are vital in two-step problems, in particular with algebra and others with little scaffolding. Showing working enables candidates to access method marks in case their final answer is wrong. Also, candidates must make sure that they do not make numerical errors especially in questions that are only worth one mark. Candidates must take note of the form that is required for answers, for example, in parts of **Question 8**.

The questions that presented least difficulty were **Questions 1(c)**, **5**, **6(a)**, **7**, **11** and **14(a)**. Those that proved to be the most challenging were the explanation of probability in **Question 14 (b)** and extraction of statistics from a cumulative frequency graph in all parts of **Question 15**. There were far fewer questions not attempted compared to previous sessions as, in general, candidates attempted the vast majority of questions rather than leaving many blank. Those that were occasionally left blank were **Questions 10, 13** and **15(c)**.

Comments on Specific Questions

Question 1

Candidates did well with this opening question based on reading and using a bus timetable. For part **(a)**, about half of all candidates were correct, giving their answer in minutes or hours and minutes. Writing the answer as 1:33 did not gain the mark as this is a time of day not a time period. Others made numerical slips in the subtraction or decided there are 100 minutes in an hour so gave 133. For part **(b)**, a few candidates counted backwards to 1605 (bus 2) or gave the time when the next bus should turn up. A large majority were able to give the correct bus to part **(c)**.

Answers: **(a)** 93 **(b)** 24 **(c)** Bus 2

Question 2

This was a well done question but incorrect answers of 1, 2, 3 or higher multiples of 5 were seen.

Answer: 10

Question 3

This question was not particularly well answered and candidates either understood which squares they must shade or had no idea of where the symmetry was. The two most common errors were to shade squares to give a diagonal line from the top left of symmetry or horizontal and vertical lines. This shows that candidates were unclear of the distinction between lines of symmetry and rotational symmetry.

Question 4

Some candidates were not accurate enough with their measuring or gave the supplement of the angle.

Answer: $x = 65$, $y = 230$

Question 5

Candidates did well here picking up at least two marks with many getting the full five. The cuboid and kite were the ones most likely to be correct with the trapezium being the most likely to be incorrectly identified.

Answers: **(a)** Cuboid **(b)** Hexagon **(c)** Parallelogram **(d)** Kite **(e)** Trapezium

Question 6

Part **(a)** was done very well with only a few giving the answer as a different power of 4 or 64^3 or 64. Part **(b)** was less well done and the common wrong answers were the ones that candidates often make to this type of question, i.e. zero or 8.

Answers: **(a)** 4^3 **(b)** 1

Question 7

The first part, reading co-ordinates, was the one that candidates found presented the least difficulty on the paper. Frequent errors seen with part **(b)**, were to give the point where the line crosses the *y*-axis, (0, 4), or a mix such as (3, 4) or (4, 3).

Answers: **(a)** (4, 5) **(b)** (3, 0)

Question 8

Standard form caused difficulties for many candidates with the main error being having more than one digit before the decimal point. The conversion into tonnes was quite well done, although a few candidates multiplied by 1000 instead of dividing.

Answers: **(a) (i)** 1.8×10^5 **(ii)** 180 **(b)** 1×10^{-3}

Question 9

Sometimes the column vector contained the correct figures in the wrong order or the sign were reversed. Occasionally, a 2 × 2 matrix of the two given points was seen.

Answers: $\begin{pmatrix} 5 \\ -1 \end{pmatrix}$

Question 10

About two thirds of candidates gave the correct answer. Very few candidates gave 'negative' as their answer but rather left the question blank or used linear, strong, graph, acceleration, line or increasing instead, More got part **(b)** correct showing they could use the line to give a single value but a few candidates gave a range of values or said, 'about 80'.

Answers: **(a)** Positive **(b)** 80

Question 11

The topic of finding lengths of sides of similar triangles was done well by a large majority of candidates, although 12 was a common wrong answer due to seeing the connection between 5cm and 15cm as 'plus 10' rather than the correct, 'multiply by 3'.

Answer: 6

Question 12

Candidates were more confident with the expand and simplify part of the question rather than that testing factorisation. Some candidates expanded the brackets correctly but made slips in collecting like terms. In part **(b)**, candidates had three factors to deal with and so this was one of the more complex sort of this type of question. Some extracted only one factor in part **(b)** and, if done correctly, this was worthy of a method mark. In general, the higher the number of marks available, the higher the number of factors to extract.

Answers: **(a)** $12x - 15y$ or $3(4x - 5y)$ **(b)** $5pq(p + 2q)$

Question 13

To get full marks, the correct method needs to be seen as well as the values for x and y. Candidates need to stop and check for the most efficient way to tackle simultaneous equations so that they have as little opportunity as possible to make numerical slips. Here, the simplest method to eliminate one variable is either to multiply one equation so the single x becomes $4x$ or the single y becomes $3y$. If using this method, candidates must make sure they multiply all three terms. Alternatively, if candidates are going to use substitution, again they should go for the simplest method, if possible that without any division, as this is often where this method goes wrong. For these equations, candidates should substitute $1 - 3y$ for x in the first equation. Of course, other methods will work but often have more opportunities for errors to be made. Candidates should realise that answers to simultaneous equations are unlikely to be inexact decimals.

Answer: $x = 4$, $y = 1$

Question 14

Candidates did very well in part **(a)**, finding the probability of picking a blue ball from the bag. The second part was either missed out or answered 'yes' with a comment such that 7 + 8 = 15 by those candidates that did not realise a multiple of 15 balls, in the same proportions, would give the same probability. Some candidates phrased the answer better than others, but a realisation that there could be 30 or 45 balls showed correct understanding of the situation.

Answers: **(a)** $\frac{7}{15}$ **(b)** No, could be a multiple of 15

Question 15

This was not a high scoring question for many candidates, with the final part being the part handled the best. Many could find the median but very many had difficulty with parts **(b)** and **(c)** where it was necessary to identify the upper and lower quartiles.

Answers: **(a)** 44 **(b)** 28 **(c)** 32 **(d)** 4

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/12
Paper 12 (Core)

Key Messages

To succeed in this paper, candidates need to have completed the full Core syllabus, be able to apply formulae, show all necessary working clearly and check their answers for sense and accuracy.

General Comments

Workings are vital in 2-step problems, in particular with algebra and others with little scaffolding. Showing working enables candidates to access method marks in case their final answer is wrong. Also, candidates must make sure that they do not make numerical errors especially in questions that are only worth one mark. Candidates must take note of the form that is required for answers, for example, in **Question 8** and the instruction to show all working in **Question 9**.

The questions that presented least difficulty were **Questions 1**, **2**, **3**, **4(a) 5(a)**, **6(a)** and **14(b)**. Those that proved to be the most challenging were the conversion from cm^2 to mm^2 in **Question 7**, rounding figures to one decimal place in order to estimate the result of a calculation in **Question 9**, and work with graphs of lines in **Questions 14(b)** and **16**. There were far fewer un-attempted questions compared to previous sessions. In general, candidates attempted the vast majority of questions rather than leaving many blank. Those that were very occasionally left blank were **Questions 4(b)**, **8(a)** and **15(b)**.

Comments on Specific Questions

Question 1

Candidates did well with this opening question. For part **(a)**, the vast majority of candidates were correct although, occasionally, the answer was given as 51, the result when the order of operations is not followed. Candidates mostly gave the correct answer of 1 for part **(b)** but occasionally gave 2 or zero.

Answer: **(a)** 5 **(b)** 1

Question 2

This question was extremely well done but some candidates gave four or six values, even though the question said there were 5 factors. Some gave multiples of 16 as their answers.

Answer: 1 2 4 8 16

Question 3

Some candidates got as far as adding the costs of Joe's purchases but did not subtract the total from $5. As long as the method of adding and then subtracting could be followed, these candidates were awarded a method mark.

Answer: $1.15

Question 4

Part **(a)** was by far the best answered part on the paper with nearly all candidates understanding the sequence. Candidates did not handle part **(b)** so well with the 3 terms given incorrectly as $n^2 - 4$, $n^2 - 5$ and $n^2 - 6$ or –6, –9 and –12 or 1, 6 and 13 (using n as 2, 3 and 4) or –3, –2 and 1 (using n as 0, 1 and 2). Candidates also tried to use the sequence in part **(a)** to form the terms in part **(b)**.

Answers: **(a)** $\frac{1}{17}$ **(b)** –2, 1, 6

Question 5

The range was generally done well but some candidates left the answer as 7 – 1 without actually doing the subtraction or gave 8 (from 7 + 1). Some worked out the mean instead. For the median, some did not order the values and so found the numerical centre of the list, 5.5, which also was the position of the median of a list of 10 numbers. Candidates must remember that the first step when finding the median, is to order all the data, not just one copy of each value. If a value was omitted from the ordered list, the answer was often given as 2 or 3. Some also gave the mean here. When candidates were finally asked for the mean, many did well and the method was clear even if arithmetic slips were seen. Some gave the mean as the answer to more than one part of this question.

Answers: **(a)** 6 **(b)** 2.5 **(c)** 2.9

Question 6

For the first part, the simplest method was just to add the given angles of the triangle. The long method was to add the angles of the triangle, then subtract their total from 180 (angles in a triangle) to find the remaining angle and finally to subtract that from 180 again (angles on a straight line) to find y. Many candidates stopped after the first subtraction from 180 giving 85 as their answer. Fewer candidates were successful with the reason for part **(b)**. The angle was generally given correctly but answers of 50 were seen.

Answers: **(a)** 95 **(b)** 130, Corresponding

Question 7

Candidates often find conversion between units challenging especially if they are units of area or volume as candidates do not take the squaring or cubing into consideration. Sometimes candidates divided by 10 or 10^2 when they should have multiplied by 10^2.

Answer: 560

Question 8

Standard form often causes difficulties for many candidates with the main errors being having more than one digit before the decimal point or omitting the $\times 10^2$. Similar errors were seen in part **(b)** along with confusion caused by the fact that the power of 10 is negative. Candidates must remember not to round the given number to fewer figures unless told to do so.

Answers: **(a)** 3.46×10^2 **(b)** 2.16×10^{-3}

Question 9

This question was almost the least successfully handled one on the paper, mainly because candidates did not follow the instruction to round each number to 1 significant figure. If candidates had done this, the calculation became very simple which is the point of this technique. The instruction to show the working was an indication that the value 100 alone would not score unless supported by relevant working.

Answer: $\frac{20+30}{0.5} = 100$

Question 10

Many candidates drew an enlargement scale factor 3 of the quadrilateral, but this was often in the wrong place, with the top left corner at *P* instead of using *P* as the centre of enlargement. Occasionally, the shape was in the correct place but one vertex was not correct.

Question 11

The most common errors were to give $x - 4$ or $x = 4$ as the answer. Occasionally candidates gave an inequality such as $x > 4$.

Answer: $x + 4$

Question 12

Candidates were not confident with this question, either because of the topic in general or because of the r^2. Often the final formula included subtraction instead of division and then square rooting.

Answer: $\sqrt{\dfrac{A}{4\pi}}$

Question 13

In order to get full marks, the correct method must be seen as well as the values for *x* and *y*. Candidates need to stop and check for the most efficient way to tackle simultaneous equations so that they have as little opportunity as possible to make numerical slips. Here, the simplest method to eliminate one variable is divide the first equation by 2 so that there was a 5*y* term in each equation. Other methods will work but often have more opportunities for errors to be made. Candidates should realise that answers to simultaneous equations are unlikely to be inexact decimals.

Answer: $x = 1$, $y = 2$

Question 14

The plotting of points *A* and *B* in part **(a)** was done extremely well. However, finding the gradient was much less well done, with errors in the signs both in the direction of the gradient and the directed numbers themselves. Many had the reciprocal of the actual gradient.

Answers: **(b)** $-\dfrac{3}{4}$

Question 15

Some candidates gave $\dfrac{1}{5}$ for each probability on the tree. Candidates knew which branch was required to answer part **(b)** but even after writing $\dfrac{1}{5}\times\dfrac{1}{5}$, many candidates then gave $\dfrac{2}{10}$ as their answer. Even if candidates got the first part incorrect, they could go on to get part **(b)** correct as the probabilities concerned were given in the question.

Answers: **(a)** $\dfrac{4}{5}$ correctly placed three times **(b)** $\dfrac{1}{25}$

Question 16

Candidates need to be confident on the parts that make up the equation of a line, namely the difference between positive and negative gradients and where the line will cross the *y*-axis. For part **(a)**, only one of the six graphs shows a line with negative gradient and the *y*-axis being crossed at –1 i.e. *E* and many candidates got this correct. There are two to decide between for part **(b)**, *A* or *B* so candidates should try $x = -1$ and $x = -\frac{1}{2}$ in the equation to see which gives $y = 0$.

Answers: **(a)** E **(b)** B

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/13
Paper 13 (Core)

Key Messages

To succeed in this paper, candidates need to have completed the full Core syllabus, be able to apply formulae, show all necessary working clearly and check their answers for sense and accuracy.

General Comments

Workings are vital in two-step problems, in particular with algebra and others with little scaffolding. Showing working enables candidates to access method marks in case their final answer is wrong. Also, candidates must make sure that they do not make numerical errors especially in questions that are only worth one mark.

The questions that presented least difficulty were **Questions 1**, **3**, **4**, **10**, and **13**. Those that proved to be the most challenging were **Questions 7** (ratio), **15(b)** (functions with a negative fraction), **16(b)** (describe a transformation) and **17(b)** (find the inter-quartile range). There were far fewer questions not attempted by candidates compared to previous sessions. Those that were occasionally left blank were those previously identified as the most challenging.

Comments on Specific Questions

Question 1

Candidates did very well with this opening question. For part **(a)**, the vast majority of candidates were correct although, occasionally, the answer was given as 405 000. In the following part, a few candidates wrote million when it should have been thousand or missed out a digit.

Answers: **(a)** 45 000 **(b)** Two thousand one hundred and thirty six

Question 2

Again candidates did well here with the occasional wrong answer of 35, as a result of the addition being carried out before the multiplication.

Answer: 23

Question 3

This was another question where the vast majority of candidates were successful. Of those that did not score full marks, it was impossible to see where figures came from as there were generally no workings.

Answer: 0.25, 30%, $\frac{6}{10}$ or $\frac{3}{5}$

Question 4

Part **(a)** was the best answered question on the paper, but far fewer candidates were confident with part **(b)**. Answers for part **(b)** included values around 11.2 (the square root of 125), 41.7 (125 ÷ 3) or 25.

Answers: **(a)** 9 **(b)** 5

Question 5

This was one of the easier conversions as it involved length not area or volume. Some candidates divided by one thousand instead of multiplying. The easiest way to realise whether the final answer would be numerically larger or smaller is to think of measurements that are known; so 1m is 1000mm, therefore the answer should be numerically larger than 4.1, and so the answer should be 4.1×1000 evaluated.

Answer: 4100 or 4.1×10^3

Question 6

This was slightly harder than other questions on definitions and names of shapes as there were no diagrams or a list of names to choose from. Many correctly gave rectangle but often this was coupled with the incorrect answer square, which has rotational symmetry order 4. The correct answer rhombus, was seen more often than parallelogram. Some tried kite or trapezium. Words that were not of 4-sided shapes included cube, quadrangle, diamond, pyramid, hexagon and rhomboid.

Answers: Two of rectangle, rhombus or parallelogram

Question 7

This question had almost the highest number of blank responses. Many candidates divided 35 by 4 and 3 in turn giving answers of about $8 and $11. These answers show no understanding of what was required by dividing a sum of money into two parts. A few realised they had to divide 35 by the sum of 4 ad 3 then multiply to find each part, but in this method there seemed to be ample opportunity for candidates to make numerical slips.

Answer: 20 and 15

Question 8

This question tested whether candidates understood how the mean is calculated and could use that understanding to work backwards to one of the original numbers. Some thought this was a question on pattern and so give another multiple of 3, in particular 3 or 9. Others gave 10 (the mean from the question). However, there were some correct responses with neat, clear and logical methods.

Answer: 7

Question 9

Most candidates tried this question with varying degrees of success. Some gave $\frac{5}{5}$ from 7 – 2 and 10 – 5. Others used a common denominator of 10, 20 or 50 and then some made errors in calculating the numerators.

Answer: $\frac{3}{10}$

Question 10

Here, sometimes the coefficients were added instead of being multiplied. Occasionally, candidates expanded the brackets correctly but then went on to combine the two terms.

Answer: $8x^2 - 12x$

Question 11

Candidates need to stop and check for the most efficient way to tackle simultaneous equations so that they have as little opportunity as possible to make numerical slips. Here, the simplest method to eliminate one variable is to add the two equations as the coefficients of y are the same with differing signs. Other methods will work but often have more opportunities for errors to be made. Candidates should realise that answers to simultaneous equations are unlikely to be inexact decimals.

Answer: $x = 3$, $y = 1$

Question 12

For part **(a)**, most candidates had the correct value for x as $110°$ but there were some that gave $70°$. In part **(b)**, some had the correct answer $90°$ or the incorrect $180°$, maybe from assuming that angle *ACB* means the same as triangle *ACB*. However, in both parts, the reasons were frequently absent or incorrect. For angle reason questions, all that is needed is a phrase such as those below or alternate angles, angles in a triangle, angles round a point or others as stated in the Core syllabus.

Answers: **(a)** $110°$, corresponding **(b)** $90°$, angles in a semi-circle

Question 13

This was answered well by nearly all candidates. Incorrect percentages of 30% or 35% were seen but 33.3% would have gained the mark.

Answer: $\frac{2}{6}$

Question 14

This was not a completely straightforward question on similar shapes as candidates had to scale down the rectangle and the scale factor was not an integer. In previous sessions, triangles have been used so the change in shape may have caused momentary confusion. Some candidates assumed that the connection was ‘subtract 3’ so gave an answer of 9.5, instead of ‘divide by 2.5’.

Answer: 5

Question 15

As a whole, this question was the one where candidates were most likely to omit one or more part. Part **(a)** was answered much better than part **(b)** but this was not surprising in that substitution of a positive integer is easier than dealing with a negative fraction.

Answers: **(a)** 13 **(b)** 0

Question 16

For part **(a)**, some candidates gave a reflection or rotation or 2 transformations. Often a co-ordinate was given instead of a vector. If a vector was given, the signs were sometimes wrong or the elements reversed. For part **(b)**, as the two triangles are different sizes, the transformation must be an enlargement. The remaining two marks for an enlargement are for the scale factor and centre of enlargement. Candidates must remember to use the proper words for transformations – reflection, translation, rotation or enlargement.

Answers: **(a)** Translation, $\begin{pmatrix} 1 \\ -6 \end{pmatrix}$ **(b)** Enlargement, scale factor 3, centre (0, 0)

Question 17

Parts **(a)** and **(c)** were handled equally well with about half the candidates gaining marks. Wrong answers for part **(a)** included 50 (the correct place to read on the cumulative frequency axis), 25 (half way along the height axis), 66 (on the cumulative frequency axis when the height is 25). It was hard to see where the wrong answers to part **(b)** came from as every little working was seen. This was also the part question on the paper that was most likely to be omitted.

Answers: **(a)** 21 **(b)** 13 **(c)** 6

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/21
Paper 21 (Extended)

Key Messages

- Candidates must know the key values of trigonometric ratios as set out in the syllabus.
- Candidates need to ensure they have mastered basic numerical skills such as rounding and simple basic rules of indices.

General Comments

Candidates were generally well prepared for the paper and demonstrated a clear knowledge of the wide range of topics tested. Candidates used their time efficiently and attempted all of the questions. The majority of candidates showed clear workings and thus were able to gain many method marks. Candidates need to take note that, when asked to expand brackets and simplify, they should not then factorise their answers (**Question 2**) and when rationalising the denominator in the surd question, they are expected to expand the numerator (**Question 5(b)**). The rules of basic indices need practising (**Question 3** and **Question 4**). The understanding of logs is generally good, but the accuracy of notation, which is difficult, needs further practice by many. The trigonometric ratios are required to be learnt (**Question 8**). Not reading the question carefully cost candidates marks using functions in **Question 9(a)** and **(b)**, when working out vectors (**Question 10**) and completing longer unstructured questions to ensure the whole question has been answered (**Question 11**). Basic algebraic skills can always be expected to be examined, and weakness in rearranging caused a loss of marks (**Question 9(c)**) which was a shame when it was clear that candidates understood what they were aiming to do.

Comments on Specific Questions

Question 1

(a) A number of candidates were unable to answer this question correctly. Common wrong responses included 47, 4700.00, 47×10^2, 5000, 4730, 4726 and 4725.60. Although not required in standard form, 4.7×10^3 was awarded the mark.

(b) This part was answered rather better than part **(a)**. The two most common wrong answers were 0.01 and 1.026×10^{-2}.

Answers: **(a)** 4700 **(b)** 0.010

Question 2

(a) Many candidates were able to simplify this correctly. Mistakes arose mainly from errors with the minus signs, particularly with the –(–7). A number of candidates expanded the brackets correctly but then went on to find the product of their answers $(-6x + 3x^2) \times (3x^2 + 7)$, instead of the sum.

(b) Many candidates scored full marks for this question. Common errors included writing $5x2y$ for $10xy$, slips with the negative signs and adding the coefficients instead of multiplying them, for example, $-10x^2$ for $-25x^2$. Unfortunately a significant number of candidates reached the correct answer only to then try and factorise it. Since the question asked candidates to expand and simplify, these answers lost the final mark.

Answers: **(a)** $-6x + 7$ **(b)** $25xy - 25x^2 - 6y^2$

Question 3

The majority of candidates answered this part correctly, with most candidates understanding that the cube root of 27 is 3. Errors included $27 - \frac{1}{3} = 26\frac{2}{3}$, $27^3 = 19683$, $3^{-1} = -3$, $\frac{1}{\sqrt[3]{27}} = \frac{1}{9}$. Candidates are very unlikely to ever be expected to work out 27^3 on a non-calculator paper, so they can use this as a clue to an error having been made. Most candidates who showed working were usually able to gain at least one mark, even from a wrong final answer.

Answer: $\frac{1}{3}$

Question 4

This question was answered well with most candidates understanding the need to square root the 16 and divide the powers of x and y by two. The most common errors came from multiplying the 16 by 0.5 to give an answer of $8x^4y$, from forgetting to square root the 16, giving $16x^4y$, or from not simplifying all three parts of the expression.

Answer: $4x^4y$

Question 5

(a) This part was answered well with many candidates scoring full marks. A common difficulty was the simplification of $\sqrt{147}$, but frequently these candidates were able to score a mark for writing $\sqrt{27} = 3\sqrt{3}$. The most common errors were with notation, by writing $\sqrt[3]{3}$ or with the misconception, $\sqrt{27} + \sqrt{147} = \sqrt{174}$.

(b) Most candidates understood the need to use the process of multiplying by $\frac{3-\sqrt{5}}{3-\sqrt{5}}$ to rationalise the denominator. A significant number of candidates then left their answer as $\frac{(3-\sqrt{5})(3-\sqrt{5})}{4}$. Stopping at this stage was not enough to score full marks, as candidates were required to multiply out the brackets and simplify the numerator. Of the candidates who proceeded further, a range of slips were seen, including slips with signs and wrong cancelling such as $\frac{14-6\sqrt{5}}{4} = \frac{7-6\sqrt{5}}{2}$.

Answers: **(a)** $10\sqrt{3}$ **(b)** $\frac{7-3\sqrt{5}}{2}$

Question 6

A number of candidates were able to come up with the correct answer for this question. There is clear evidence that these candidates understand the rules of logs but only the very best candidates were able to express the mathematics accurately. For example, notation errors, such as log5 – log25 = $\frac{\log 5}{\log 25} = \log\frac{1}{5}$ were often seen, but often these candidates were able to recover and obtain the correct answer. Writing log5 – log25 = log5 was a common error leading to the wrong answer, x = 2, but some of these candidates were able to obtain a method mark at some stage. A common misconception, by candidates with no evidence of understanding logs, was to 'cancel' the word 'log' so that log$x$ + log5 – log25 = log10 became x + 5 – 25 = 10 leading to x = 30.

Answer: 50

Question 7

The table was completed accurately by many candidates and four marks were frequently scored. Most candidates were able to obtain at least the 240 and 72. The 'number of boys who could not swim' proved more difficult with candidates either unable to do the arithmetic or finding $\frac{2}{5} \times 72$ or of $\frac{3}{2} \times 72$.

Answer:

	Boys	Girls	Total
Can swim	112	168	280
Cannot swim	48	72	120
Total	160	240	400

Question 8

(a) For those candidates who knew that sin30° = 0.5 this question was straightforward. Without this knowledge, both this part and part **(b)** were impossible. Some candidates gave the answer $2 \times \sin 30^\circ$ which was clear evidence that they understand trigonometry, but they need to rote learn the common values of sinθ, cosθ and tanθ for θ = 0°, 30°, 45°, 60° and 90°.

(b) The correct answer was frequently given. The most direct approach was tan$y$ = 1, but many candidates were also successful by using a rather longer approach that included finding the hypotenuse as $\sqrt{2}$ and then using either sin$y$ or cos$y$. Although, in this question, the right hand triangle was in fact isosceles, candidates should not have been assuming this, but deducing this from their evidence that x = 1.

Answers: **(a)** 1 **(b)** 45°

Question 9

(a) Almost all candidates answered this correctly and understood the need to substitute x = 4 into f(x). The few candidates who lost the mark had usually tried to solve f(x) = 4 or had tried to simplify 4f(x) or similar.

(b) Many candidates answered this well and understood that $\frac{1}{4} = \frac{1}{3x-2}$ needed to be solved. Most of these went on to give x = 2 as their final answer but others either could not rearrange to get 4 = 3x – 2 or gave their final answer as f(2), when x = 2 was required. A significant number of candidates started the question by substituting x = $\frac{1}{4}$ into f(x) and wrongly evaluating $f\left(\frac{1}{4}\right)$.

(c) Some candidates answered this well and demonstrated clear algebraic skills. Other candidates were able to obtain method marks for changing the x and y in their formula and for starting the rearrangement process correctly. Errors often then arose because candidates did not use brackets when writing $(3x - 2)y = 1$ which wrongly led to $3x - 2y = 1$ or because they rearranged wrongly to either $3x = \frac{1}{y} - 2$ or $3x = \frac{1+2}{y}$. Candidates who used a flow diagram method were rarely successful. A number of candidates were muddled between $f^{-1}(x)$ and $[f(x)]^{-1}$ giving $\left(\frac{1}{3x-2}\right)^{-1} = 3x - 2$ as their answer.

Answers: **(a)** 0.1 oe **(b)** 2 **(c)** $\frac{1}{3}\left(\frac{1}{x}+2\right)$

Question 10

(a) Whilst many candidates were able to answer this part correctly, other candidates struggled to recognise that $\overrightarrow{DC} = \frac{1}{2}\mathbf{p}$ and were hence unable to proceed. Errors included $\overrightarrow{DC} = 2\mathbf{p}$, $\overrightarrow{DM} = \frac{1}{2}\mathbf{p}$, $MC = 0.5 \times DC$ and $\frac{1}{2} \times \frac{1}{3} = \frac{1}{5}$

(b) Only a small number of candidates completed this part correctly. Many candidates either found the vector NM or took the route M–C–B–N which required vector BC. A significant number of candidates believed $\overrightarrow{BC} = \mathbf{q}$, this gave a common wrong answer of $\frac{1}{6}\mathbf{p} - \mathbf{q} - \frac{1}{4}\mathbf{p}$. For candidates who showed their workings, a mark was awarded for using $\frac{3}{4}\mathbf{p} - \mathbf{q}$. In addition, the final mark required like terms to be correctly collected together. Unfortunately some candidates who had correctly completed the hard work either forgot to collect like terms or were unable to add the fractions correctly.

Answers: **(a)** $\frac{1}{6}\mathbf{p}$ **(b)** $\frac{5}{12}\mathbf{p} - \mathbf{q}$

Question 11

This question required candidates to work through a number of steps systematically and many candidates were able to do this and score full marks. It appeared that other candidates had not taken in the whole question and either found only the midpoint or the perpendicular gradient, not going on to find any equation of a line. Many candidates successfully used simultaneous equations to find the gradient (and y-intercept for line AB), although this was not the quickest method. The most common misconception was to find the equation of the line through AB (which was not required) as $y = -0.5x + 9$ (using either point A, B or (4, 7)) and to give the perpendicular line as $y = 2x + 9$.

It is important to note that candidates were not expected to draw axes for this question but to use their knowledge of how to find the gradient using $\frac{y_1 - y_2}{x_1 - x_2}$ the midpoint using $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ and perpendicular gradients using $m_1 \times m_2 = -1$.

Answer: $y = 2x - 1$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/22
Paper 22 (Extended)

Key message

Candidates need to show all of their working. Incorrect answers without working cannot be given credit, whereas partial credit can be awarded if a correct method is shown. They should ensure that their working is clear and not merely a collection of numbers scattered over the page.

General comments

Candidates were reasonably well prepared for the paper and demonstrated very good algebraic skills. Many candidates lost marks through careless numerical slips, particularly with negative numbers and simple arithmetic operations. Candidates should always leave their answers in their simplest form. However, many candidates lost marks through incorrect simplification of a correct answer. More work on simplifications would be beneficial. Candidates must know that the equation of any straight line passing through the origin will be of the form $y = mx$.

Comments on specific questions

Question 1

(a) Many candidates obtained the correct answer, but a significant number of candidates were unable to deal with the decimal point correctly and gave their answer as 0.9.

(b) This part was correctly answered by nearly all candidates.

Answer: **(a)** 0.09 **(b)** 20

Question 2

(a) (i) This part was correctly answered by nearly all candidates.

(ii) Candidates demonstrated excellent manipulative skills with indices with many correct answers.

(b) Although there were many correct answers, there were careless errors seen.

Answer: **(a)(i)** 1 **(ii)** 1000 **(b)** 5^7

Question 3

Although there were many correct answers, this question discriminated between candidates. Some candidates were unable to correctly square a negative number; others who correctly found the value of 52 were unable to simplify the resulting surd.

Answer: $2\sqrt{13}$

Question 4

(a) Candidates were asked to give their answers as decimals, but a significant number ignored this demand and gave their answers as fractions. Setting up the fraction was too demanding for some candidates with $\frac{200}{46}$ being a common mistake, leading to probabilities of more than 1.

(b) There were many incorrect answers for this part, with many candidates giving Babar as their answer justifying their answer as this gave the highest probability.

(c) This part was well answered.

Answer: **(a)** 0.23, 0.3, 0.15, 0.2 **(b)** Dieter, more throws **(c)** 246

Question 5

(a) This part was well answered.

(b) This part discriminated well between candidates. Although there were many correct answers, a significant number of candidates gave their answer as 2 or –0.5.

Answer: **(a)** (4, 4) **(b)** –2

Question 6

There were many correct answers to this question. The most common error was in simplifying $\sqrt{3}\times\sqrt{3}$.

Answer: $28+10\sqrt{3}$

Question 7

Although there were many correct answers to this question, it clearly demonstrated that some candidates are unhappy at working with inequalities. Many candidates who arrived at the correct value of 5.5 spoilt their work by an incorrect inequality.

Answer: $x \geqslant 5.5$

Question 8

This question was well answered by the majority of the candidates. Candidates were able to correctly calculate the two separate volumes and then add them. Some candidates did not leave their answer in terms of π.

Answer: 396π

Question 9

This question discriminated well between the candidates. Although there were many fully correct answers, numerical mistakes in equating coefficients were common, and candidates who correctly found the first variable frequently did not find the second variable correctly.

Answer: $x = 3$, $y = -2$

Question 10

(a) The majority of candidates answered this part correctly.

(b) Although many candidates realised that this part depended on reversing logs, many found the manipulation of the index too challenging.

(c) The majority of candidates answered this part correctly.

Answer: **(a)** 4 **(b)** 1000 **(c)** 10

Question 11

(a) Candidates who realised that angle *PCO* was a right angle normally answered this part correctly. There were some numerical errors when using the isosceles triangle.

(b) The majority of candidates were able to score this mark following their answer in the previous part.

(c) This part proved to be challenging. Candidates needed to realise that there was a cyclic quadrilateral.

Answer: **(a)** 110 **(b)** 55 **(c)** 105

Question 12

This question proved to be a challenge for many candidates. The most common error was distinguishing between diagrams B and E.

Answer: F E D A

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/23

Paper 23 (Extended)

Key message

Candidates need to show all of their working. Incorrect answers without working cannot be given credit, whereas partial credit can be awarded if a correct method is shown. They should ensure that their working is clear and not merely a collection of numbers scattered over the page.

General comments

Candidates were reasonably well prepared for the paper and demonstrated very good algebraic skills. Many candidates lost marks through careless numerical slips, particularly with negative numbers and simple arithmetic operations. Candidates should always leave their answers in their simplest form. However, many candidates lost marks through incorrect simplification of a correct answer. More work on simplifications would be beneficial. Candidates must be able to find HCF and LCM of numbers when the numbers are given in index form.

Comments on specific questions

Question 1

(a) Many candidates obtained the correct answer, but a significant number of candidates gave an answer of 0.605.

(b) This part was well answered.

Answer: **(a)** 0.000 605 **(b)** 7 000 000

Question 2

Although there were many correct answers, candidates lost marks by not following the instructions in the question, by writing all numbers correct to one significant figure.

Answer: 15

Question 3

This question proved to be too challenging for many candidates, and more work on this topic would be beneficial.

(a) (i) Many candidates omitted to give their answer as a product of prime factors, as requested by the question.

(ii) There were very few correct answers to this part. Some candidates expanded the original number and then tried to find the square root.

(b) Again, there were very few correct answers to this part.

Answer: **(a)(i)** $2^2 \times 3$ **(ii)** $2 \times 3 \times 7^3$ **(b)** 45

Question 4

(a) Some candidates produced excellent solutions to this part. The common errors occurred in careless numerical slips when adding the different parts that had been correctly found.

(b) This part proved to be challenging to candidates. A number gave an answer of reflective symmetry and carefully drew their 'lines of symmetry' on the diagram. This should have given the candidates a clue that there was no line symmetry.

Answer: **(a)** $64 + 6.25\pi$ **(b)** Rotational, order 2

Question 5

Although all candidates made some progress on this question, there were errors in the manipulation of the signs when expressions were simplified.

Answer: $x > 8$

Question 6

(a) This part was well answered.

(b) (i) This part was well answered.

(ii) This part was well answered, although there were some carless arithmetic slips that spoilt a potential correct answer.

Answer: **(a)** Bigger sample **(b)(i)** $\frac{24}{150}$ **(ii)** 480

Question 7

(a) The simplest method for solving this pair of simultaneous equations was to use substitution. Many candidates, however, are drilled into using the elimination method. This led to many careless errors when dealing with the signs of the variables.

(b) (i) There were many correct answers to this part.

(ii) This part proved to be challenging for many candidates. Candidates were unable to interpret the 'equality' and instead placed Q in a region rather than on a line.

Answer: **(a)** (3.2, 2.6)

Question 8

(a) This part was answered correctly by the majority of the candidates.

(b) This part was answered correctly by the majority of the candidates.

(c) Candidates needed to find an 'extra' angle to be able to complete this part. Many candidates did not realise that there was a cyclic quadrilateral.

Answer: **(a)** 90 **(b)** 35 **(c)** 55

Question 9

This question was a discriminator between the candidates. Virtually all candidates were able to score one mark, normally from the intersection of P and R, but then the drawing of Q as a subset of R proved to be too challenging.

Question 10

(a) The majority of candidates scored both marks. The common error was in the signs of the number terms.

(b) Again, the majority of candidates scored both marks. The common error was when candidates 'cubed' as their first step, but made errors in handling the term in *a*..

Answer: **(a)** $(x - 5)(x + 2)$ **(b)** $(ay)^3$

Question 11

(a) Candidates realised that this part was related to 'squaring', but there were many answers of 2 given.

(b) (i) This part was well answered.

(ii) An answer of 2 was seen as frequently as the correct answer.

Answer: **(a)** –2 **(b)(i)** 12 **(ii)** 16

Question 12

This question proved to be a challenge for all but the most able candidates. Candidates should have realised from the shape of the graph that a must be positive.

Answer: $a = 2$, $b = 2$, $c = -12$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/31
Paper 31 (Core)

Key messages

Candidates need to have covered the full syllabus. They should show all their working out especially for follow through questions and give their answers correct to 3 significant figures (unless otherwise specified in the question). Candidates must have a graphics calculator and know how to use it.

General Comments

Candidates appeared to have enough time to complete the paper as most attempted all the questions.

Candidates need to be careful about the accuracy of their answers. If no specific accuracy is asked for in the question, then all answers should be given exactly or to 3 significant figures. Giving answers to fewer significant figures will result in a loss of marks.

Candidates must also show all their working out. Often answers were given with no working out shown. When correct working out is shown then partial marks can be awarded if the final answer is incorrect.

Candidates should bring the correct equipment to the examination. Many appeared not to have a ruler with them to draw a straight line. It also appeared as if some candidates did not have a graphics calculator.

Comments on Specific Questions

Question 1

(a) Although the majority of candidates answered this correctly, there was a large minority who could not write down the number correctly; 3058, 30 058 and 30 000 058 were frequently seen.

(b) Many candidates managed to get –6 here, but 6 was also seen.

(c) This part was generally well answered, although 21 700 and 22 000 were the most common wrong answers.

(d) Most candidates managed this, but 0.056 was also seen.

(e) This part was very well done. A few candidates multiplied by 7 and divided by 3.

(f) Most managed this part well – the most common wrong answer being 19.

(g) A lot of candidates could answer this correctly but $\frac{65}{100}$ and 0.65 were also frequently seen.

(h) This part was not very well attempted. Although a fair number of candidates did get the correct answer, 33.25 : 44.33 was a very common answer.

Answers: **(a)** 300 058 **(b)** –6 **(c)** 21 600 **(d)** 0.06 **(e)** 78 **(f)** 23 **(g)** $\frac{13}{20}$ **(h)** 76 : 57

Question 2

(a) Many candidates gave the correct answer but $8x + 2y$ and $4x + 4y$ were also often seen.

(b) Most candidates managed to get at least 1 mark here for writing 2(3) – 2 + 3(4), and quite a good number managed to add it up correctly.

(c) The majority of candidates got this part correct. Other candidates managed to pick up 1 mark for their working out even if their final answer was not correct.

(d) This part was very well done with most being able to find the correct value for x.

(e) Although many candidates did get the correct answer others wrote 0, 1 and 2.

Answers: **(a)** $8x – 2y$ **(b)** 16 **(c)** 5.1 **(d)** 2 **(e)** –1, 3, 5

Question 3

Nearly all candidates gained some marks on this question. Most could at least find 26 for b, others picked up a follow through mark for d and many managed to find all four angles correctly.

Answers: $a = 90$, $b = 26$, $c = 64$, $d = 116$

Question 4

(a) This part was very well done with only the occasional candidate putting $ 25.

(b) Many worked this out correctly. Some only multiplied the lunch cost by 30 and some only added it on once.

(c) A lot of correct or correct follow through answers were seen for this part. Some candidates divided by 33 and others worked out what the trip cost for the candidates only and divided that amount by 30.

Answers: **(a)** 345 **(b)** 1110 (30) 37

Question 5

(a) (i) Although there were many correct answers seen, it appeared as if some candidates were not sure of the terminology in this question; 6 and 5.75 were also seen.

(ii) This was reasonably well done. Some candidates wrote 5, 6.

(iii) This was not a term that was well known. Some did manage to find the correct answer but 2 and 4 were also seen quite often.

(iv) Many candidates managed this part. Some wrote 8 – 2 and others just wrote 8.

(v) This part was answered the best. However, some candidates just wrote the total without dividing it by 8.

(b) (i) The majority of candidates answered this part correctly. A few seemed not to know how to answer the question.

(ii) Very many correct bar chart or correct follow through bar charts were seen.

Answers: **(a)(i)** 8 **(a)(ii)** 5.5 **(a)(iii)** 4.5 **(a)(iv)** 6 **(a)(v)** 5.75 **(b)(i)** 1, 0, 1, 2, 1, 0, 3

Question 6

(a) There were quite a few correct answers for the volume, but there were also some candidates who did not know how to find the volume of a cuboid.

(b) (i) Candidates would benefit from more practice with this type of question as it was not well done at all. The most frequent wrong answer was 75 x 25.

(ii) Very few candidates could change their answer to square metres. The vast majority divided by 100. Some divided by 1000 and a few multiplied by 100.

(c) Most candidates worked this out correctly and gave the correct answer. Some forgot to answer the question and so lost a mark Others just added up the width of the books without multiplying by the number of books.

Answers: **(a)** 3750 **(b)(i)** 4150 **(b)(ii)** 0.415 **(c)** 70, yes.

Question 7

(a) Most candidates could write down the next two terms of the sequence correctly.

(b) Candidates found this part difficult, and few could find the correct expression for the *n*th term. $n - 7$ was the most common wrong answer.

Answers: **(a)** –5, –12 **(b)** $30 - 7n$

Question 8

(a) Few candidates managed to find the correct gradient. Some candidates picked up a mark for dividing the equation by 2.

(b) Very few candidates seemed to know that the gradient of parallel lines is the same, and so there were few correct answers here too.

(c) Only the most able candidates could write down the correct equation of the line.

Answers: **(a)** $-\frac{1}{2}$ **(b)** $-\frac{1}{2}$ **(c)** $-\frac{1}{2}x+6$

Question 9

(a) (i) Although many candidates wrote the correct answer here, 2 was a very common wrong answer.

(ii) Some candidates wrote down the numbers in the intersection and others the numbers in the union.

(iii) Similarly for this part; if candidates had the previous part correct then they usually managed to get this part correct too.

(iv) Some candidates managed this correctly while others wrote 1, 2, 3, 6.

(v) A majority of candidates gave the correct answer to this part.

(b) Candidates found this part hard. Some candidates did write down 6 but more wrote down 1 and others wrote down all the numbers in U.

Answers: **(a)(i)** 2, 3, 6 **(a)(ii)** 3, 6 **(a)(iii)** 2, 3, 4, 5, 6 **(a)(iv)** 1, 2 **(a)(v)** 4, 5 **(b)** 6

Question 10

(a) The line of reflection was often correctly drawn but fewer candidates managed to write down the correct equation of the line.

(b) Many candidates wrote the correct translation vector but others had various arrangements of 4, –4, 3 and –3.

(c) The angle of rotation was often given correctly but few wrote down the correct centre of rotation.

Answers: **(a)** correct line, $y = 3$ **(b)** $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$ **(c)** (0, 0), 90° anticlockwise

Question 11

(a) Many candidates lost all the marks here because they gave an answer of 3 min 2 s or 3 min 20 s without showing any working out. Those who did show 3.2 in their working out gained a mark. Some candidates managed to find the correct time.

(b) Fewer candidates managed to find the correct average speed. Those who showed their working out were often rewarded with a mark for dividing 168 by the time. The most common wrong answer were 123.5 and 1.75.

Answers: **(a)** 3 min 12 s **(b)** 105

Question 12

(a) The majority of the candidates managed to complete the branches of the tree diagram correctly.

(b) Although quite a few did get the correct answer here, many candidates wrote $\frac{1}{3}$ or added $\frac{1}{18}$ and $\frac{1}{3}$ instead of multiplying.

(c) Some candidates managed to get follow through marks here. Others lost a mark for writing an answer that was not a whole number. There were not many correct answers though.

Answers: **(a)** $\frac{79}{80}$, $\frac{2}{3}$ $\frac{1}{3}$, $\frac{1}{50}$ $\frac{49}{50}$ **(b)** $\frac{1}{240}$ **(c)** 1

Question 13

(a) Few candidates knew the term “equilateral”. Some wrote that the triangle was isosceles and others wrote down that it was a radius. There were many incorrect answers here. Some candidates managed to pick up a mark by writing all the sides or angles on the diagram correctly.

(b) Although a few candidates knew the formula to find the length of the arc, the majority of candidates just wrote down 46 for the answer.

(c) As above, very few candidates knew the formula for the area of a sector.

(d) This part was also poorly attempted. The most common wrong answer was 23 x 46. Some candidates lost marks because they did not show their working out for finding the perpendicular height of the triangle and wrongly rounded their answer to 40. Had they shown some working out then they could have gained method marks.

(e) There were many blank spaces here when candidates realised that their answer to part **(c)** was either the same or smaller than their answer to part **(d)**.

Answers: **(a)** equilateral triangle so all sides and angles are equal **(b)** 48.2 **(c)** 1110 **(d)** 916 **(e)** 194

Question 14

(a) There were some good attempts to sketch the curve correctly. Not all curves went through three quadrants and not all cut the axes at the correct places. It seemed as if some candidates did not have a graphics calculator.

(b) Very few candidates found the correct answer here. Most just wrote down –3.

(c) There were a lot of blank spaces here and it appeared that candidates did not know what an asymptote was. Only a few candidates gave the correct answer.

(d) A reasonable attempt was made to sketch the line. Many candidates did not have a ruler. Others did not have their line cutting the y-axis at 3.

(e) A few candidates managed to use their graphics calculator correctly and found the correct co-ordinates for the point of intersection. However, there were not many correct answers.

Answers: **(b)** –3.17 **(c)** $y = -1$ **(e)** (0.323, 2.35)

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/32

Paper 32 (Core)

Key Messages

To succeed in this paper, it is essential for candidates to have completed full syllabus coverage. Sufficient working must be shown to enable method marks to be awarded, and full use made of all the allowable functions of the graphics calculator.

General Comments

In general, this paper appeared to be accessible to most of the candidates. Where questions were omitted, this seemed to indicate poor knowledge of certain topics rather than a lack of time.

The best responses seen showed a sufficient amount of working and gave answers in full or correct to 3 significant figures. Candidates who showed no working at all risked losing all the marks for that part of the question if they made a transcription error, a slip on the calculator or gave a 2-figure answer.

Topics where most candidates did well included curve sketching and interpreting charts and Venn diagrams. There was significant weakness in trigonometry, time conversion and mensuration.

Comments on Specific Questions

Question 1

In general, this question was answered well by nearly all candidates.

(a) (i)&(ii) Most candidates gave the correct answer to both parts.

(b) This was answered correctly by nearly all the candidates.

(c) Nearly all candidates evaluated this number correctly. Answers given correct to 3 or more significant figures gained the mark as long as they were rounded correctly and not truncated.

(d) Most candidates obtained the correct answer except for those who misread the question as 3 times the square root of 216.

(e) The majority of candidates understand what is meant by HCF and there were only a few wrong answers**.**

(f) The LCM was less well understood with most wrong answers being 2, and a few 48.

(g) This was done well by the majority; a few correctly divided 442 by 17 and then made mistakes and a further few divided 442 by 8 and by 9 in turn to obtain the two parts of the ratio.

(h) Most candidates reached the correct answer except for those who calculated the change after buying only one hamburger.

Answers: **(a)(i)** 32650 **(ii)** 32700 **(b)** 62.6 **(c)** 530.8416 **(d)** 6 **(e)** 9 **(f)** 24 **(g)** 208 : 234 **(h)** 1.60

Question 2

(a) Nearly all candidates answered this correctly, some cancelling the fraction to its lowest terms.

(b) This part was not answered very well. Although nearly all the candidates converted the fraction to a decimal correctly, many did not multiply by 100 to obtain a percentage. Some answers were given to 4 decimal places and a considerable proportion were truncated to 66.66 instead of being rounded to 66.67.

(c) Most candidates gave the correct answer.

(d) This was generally answered well.

(e) Although many answers were correct, a number of candidates only found 20% of \$96 instead of reducing \$96 by 20%.

(f) There were many correct answers to this part although some were spoiled by adding the interest to \$800 to find the total amount after 5 years. A significant number of candidates used compound interest, either with a formula or year by year, and a few decreased \$800 by 3% for 5 years.

Answers: **(a)** $\frac{75}{100}$ **(b)** 66.67 **(c)** $\frac{12}{25}$ **(d)** 5.76 **(e)** 76.80 **(f)** 120

Question 3

Candidates had no difficulty in writing these probabilities in a correct form, but many made errors when considering prime and square numbers.

(a) Almost all candidates had the correct answer.

(b) Many candidates forgot to include 2 as a prime number, while others included 9.

(c) This part was answered correctly by nearly all candidates.

(d) Many candidates neglected to include 1 as a square number.

Answers: **(a)** $\frac{5}{10}$ **(b)** $\frac{4}{10}$ **(c)** $\frac{0}{10}$ **(d)** $\frac{2}{10}$

Question 4

(a) Candidates successfully added the number of candidates given in the table.

(b) Candidates had no difficulty in identifying the most popular colour.

(c) (i) While a few candidates made a guess at these angles, most calculated them without making any errors.

(ii) Most candidates were able to complete the pie chart within an acceptable range of accuracy.

Answers: **(a)** 40 **(b)** Blue **(c)(i)** 9, 36, 72

Question 5

A few candidates ignored the fact that the figures in the sets represented the number of candidates and instead treated them as elements in the sets, resulting in answers such as {18, 6} in part **(b)**.

(a) This was usually correct.

(b) Apart from the example given above, a frequent mistake in this part was an answer of 18, ignoring the number of candidates in the intersection.

(c) While there were many correct answers, a frequent error was to ignore the symbol indicating the complement of the named set, giving rise to answers of 29 or {18, 6, 5}. Another was to confuse the symbol for "union" with the one for "intersection".

(d) There was a variety of wrong answers to this part, and the many answers of 11 indicated that the candidates had simply neglected to include the single candidate who ate neither toast nor cereal.

Answers: **(a)** 6 **(b)** 24 **(c)** 1 **(d)** 12

Question 6

There were many accurate solutions to this question but some candidates confused area and volume. A lack of working also contributed to a loss of marks.

(a) A number of candidates found only the area of one face of the cube.

(b) Most candidates found the surface area of the sphere successfully.

(c) Because this part involved finding the sum of two volumes, it was important for candidates to show how each volume was found. Simply writing the formula for the volume of a sphere was not sufficient – candidates had to use the value of r in this formula.

(d) Two major errors appeared in this final part. Many candidates divided their total volume by 4 instead of multiplying. Having obtained their answer in cents, a large number of candidates were unsure of the next step. Answers were often left in cents or divided by 10 in an attempt to convert to dollars.

Answers: **(a)** 600 **(b)** 314 **(c)** 1520 **(d)** 60.9

Question 7

This was a challenging question for many candidates. Whilst the abler ones submitted some good answers, many others struggled with even the simpler parts of the question. Most were able to use Pythagoras' Theorem successfully but their use of trigonometry was sometimes poor and the naming convention for angles was not always understood.

(a) Answers of 45 and 90 were often given. As long as candidates were considering the correct angle, they should have realised that it was an obtuse angle.

(b) For most candidates this was a straightforward use of the tan ratio and the answer was obtained without difficulty. A few found angle *CAB* instead of *BCA*.

(c) This part was answered well by most candidates.

(d) Many candidates used Pythagoras' Theorem again here and while the correct answer gained some marks, not all the method marks were available to those who did not use trigonometry as instructed.

(e) (i) This part of the question caused many candidates the greatest problem. A number of them described the shape *DEFG* as a square because of its appearance, but diagrams are not drawn to scale and the given dimensions clearly indicate a rectangle. Few candidates mentioned the fact that triangle *CFG* is isosceles although many did state that 31 – 18 = 13.

(ii) Many were able to add together all the lengths to find the perimeter.

(f) Many candidates earned only a part mark here for the area of triangle *ABC*, since they treated *DEFG* as a square and triangle *CFG* as having a base of length 13 cm.

Answers: **(a)** 135 **(b)** 71.6 **(c)** 37.9 **(d)** 25.5 **(e)(ii)** 173 **(f)** 612

Question 8

Although parts of this question were answered well, there were some significant gaps in the candidates' understanding of this topic.

(a) Those who completed the scatter diagram did so accurately, but a number of candidates did not plot the remaining six points.

(b) Many candidates tried to embellish their response but the word "positive" was all that was required.

(c) (i) Nearly all the candidates calculated the mean number of shirts correctly, although some wrote 7 in addition to, or sometimes in place of, 6.75.

(ii) Nearly all the candidates calculated the mean number of jackets correctly.

(iii) Most candidates plotted the position of the mean point accurately, with many indicating it in some way to distinguish it from the original plots.

(d) Candidates need to remember that the line of best fit must be a ruled straight line passing through the mean point. Candidates who did rule a line through the mean point almost invariably made it also pass through the origin, although a better gradient would have taken it through the point (0, 2). Candidates who had not plotted the required points in part **(a)** were at an obvious disadvantage in this part.

(e) Most candidates gave an answer between 5 and 6, with some not realising that an integer answer would be appropriate here, unlike the mean number of jackets.

Answers: **(b)** positive **(c)(i)** 6.75 **(c)(ii)** 5 **(e)** 5 or 6

Question 9

The sketching of the graphs was done well in general, but with some exceptions candidates are still careless about giving co-ordinates correct to 3 significant figures. Candidates are reminded that, in a number such as 0.808, the zero before the decimal point is not counted as being significant so that 0.81 is not an acceptable answer.

(a) Most candidates sketched a parabola of approximately the right size and position on the diagram.

(b) This was well answered by the majority of candidates.

(c) These two answers were rarely given correct to 3 significant figures even by candidates who gave accurate co-ordinates in later parts of the question.

(d) Many candidates used their calculators correctly to find the local maximum point, although there was a variety of wrong answers and blank answer spaces among the weaker entries.

(e) Nearly all the candidates recognised the equation of a straight line and many drew this line in a suitable position on the diagram.

(f) Once again, many candidates appeared to know how to find the co-ordinates of the points of intersection, but answers were often given correct only to 1 or 2 significant figures, and sometimes the negative signs were ignored as well.

Answers: **(b)** 6 **(c)** –2.47, 0.808 **(d)** (–0.833, 8.08) **(f)** (–2.59, –1.18) (0.257, 4.51)

Question 10

(a) (i) This equation was solved correctly by a large number of candidates.

(ii) Most candidates obtained the answer 3 but many neglected to give their response as an inequality. Some weaker candidates simply chose a value, such as 2, for x.

(b) (i) A large number of candidates answered this correctly with only a few multiplying the indices.

(ii) Most candidates seemed to know that the indices must be multiplied.

(iii) Many candidates gave the correct answer although there were a number of slips, such as writing $6r^3$ or even $6r^4$.

(c) This part was done well, although a few candidates imagined that this was an equation which they were required to solve.

(d) Most candidates were able to factorise the expression fully or at least partially.

Answers: **(a)(i)** -2 **(ii)** $x < 3$ **(b)(i)** s^7 **(ii)** t^8 **(iii)** $6r^2$ **(c)** $10x - 9$ **(d)** $3y(5 - y)$

Question 11

Many candidates appear to have considerable difficulty in dealing with time conversion.

(a) There were two approaches to this question. Candidates who divided the distance by the time obtained an answer of 0.3 and many left this as the answer instead of multiplying by 60 to find the number of kilometres travelled in one hour. Those who attempted to convert the 50 minutes into hours first used 0.83 and gave a final answer of just over 18 minutes. If these candidates had used their calculators correctly they would have obtained the exact answer and gained all the marks available.

(b) Candidates were more successful in this part, although there was one major error which appeared all too frequently. Once again the correct approach was taken, to divide the distance by the speed. The result of 1.25 was correctly multiplied by 60 by many candidates to convert the time to minutes, but a significant number of them stated that this was one hour and 25 minutes, giving a final answer of 85 minutes.

Answers: **(a)** 18 **(b)** 75

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/33

Paper 33 (Core)

Key Messages

To succeed in this paper, it is essential for candidates to have completed full syllabus coverage. Sufficient working must be shown, and full use made of all the allowable functions of the calculator.

General Comments

In general, this paper appeared to be accessible to most of the candidates. Where questions were omitted, this seemed to indicate poor knowledge of certain topics rather than a lack of time.

The best responses seen showed a sufficient amount of working and gave answers in full or correct to 3 significant figures, as required by the rubric of the paper. Candidates who showed no working at all risked losing all the marks for that part of the question if they made a transcription error, a slip on the calculator or gave a 2-figure answer.

Topics where most candidates did well included sequences, interpreting charts and Venn diagrams and solving equations. There was significant weakness in bearings, combining probabilities, co-ordinate geometry and mensuration.

Comments on Specific Questions

Question 1

Many candidates correctly selected the even number, the prime number, the multiple of 7 and a factor of 84. There were some errors selecting the square number and more candidates were unable to name the triangle number.

Answers: **(a)** 12, 14 or 16 **(b)** 13 **(c)** 14 **(d)** 12 or 14 **(e)** 16 **(f)** 15

Question 2

(a) A number of candidates forgot that they needed to use brackets on their calculators or to evaluate the subtraction before attempting the division, resulting in frequent answers of 14.172….

(b) (c) These two parts were answered correctly by the majority of candidates.

(d) While the numbers were put in the correct order by many candidates, there were a number who misread the inequality signs and ignored the word "smallest". These candidates just wrote the numbers down in decreasing order.

Answers: **(a)** 6.21 **(b)** 144 **(c)(i)** 348.4 **(ii)** 350 **(d)** $0.3 < 33\% < 3.33\times10^{-1} < \frac{1}{3}$

Question 3

(a) Most candidates divided 16.80 by 48 to find the cost of one tin of beans. However, many left the answer as 0.35 instead of converting this cost into cents. This frequently led to errors in the subsequent parts of the question.

(b) Most candidates were able to evaluate the actual profit in part **(i)** but in part **(ii)** many found the profit as a percentage of the selling price and not of the cost price.

(c) (i) Once again, most candidates worked out the reduced price of the tins correctly. However, some found 20% of 75 cents instead of 80%.

(ii) Many candidates were able to gain this follow-through mark in spite of errors they may have made earlier.

Answers: **(a)** 35 **(b)(i)** 40 **(ii)** 114% **(c)(i)** 60 **(ii)** 20

Question 4

(a) It was clear that some candidates had learnt correctly how to set out a stem-and-leaf diagram and there were many good answers, with occasionally one element missing or in the wrong position. However, there was evidence that some candidates had very little knowledge of what was required.

(b) Nearly all candidates were able to read the required information from the pie chart.

Answers: **(b)(i)** Burger **(ii)** 22

Question 5

(a) (i) This was well done except for a few candidates who gave the answer 4.

(ii) Most candidates successfully solved this equation.

(b) (i) Substitution was done well and the correct answer obtained by many. Those who went wrong frequently did so because they wrote down values inaccurately, for instance using 2 instead of 2.1.

(ii) Rearranging the formula was less well carried out, partly because a number of candidates substituted numerical values from part **(i)** into this separate part.

(c) (i) Most candidates correctly added the indices.

(ii) Many candidates were able to complete the numerical division and subtract the indices correctly. A few candidates thought that they could cancel out the letter y and gave the incorrect answer of 4^6.

Answers: **(a)(i)** 16 **(ii)** 4 **(b)(i)** –5.64 **(ii)** $\dfrac{M - 3.4L}{2.8}$ **(c)(i)** n^{12} **(ii)** $4y^6$

Question 6

This question was answered well by nearly all of the candidates.

(a) The patterns were continued correctly with some very neat drawings in evidence.

(b) Nearly all candidates were able to complete the sequence of areas correctly.

(c) This was the only part of the question to cause a problem for a small number of candidates who gave $n + 3$ as their answer.

Answers: **(b)** 6, 9, 12, 15, 18 **(c)** $3n$

Question 7

(a) All the candidates were able to complete the frequency table correctly from the given bar chart.

(b) (i) Most candidates gave the correct answer for the mode, although a few gave the largest frequency (6) instead of the corresponding score.

(ii) While more able candidates were able to find the range successfully, a common mistake was again to use the frequencies rather than the scores.

(iii) Many candidates were able to find the median.

(iv) This part was not answered well. While a number of candidates correctly found the sum of all the scores and divided by the number of students, they gained only a method mark because their answer was truncated to 3.72. Other common mistakes were to divide the sum of the scores by 7, or to divide the number of students by 7.

(v) Many candidates had great difficulty with this part, with many not writing down any answer. Candidates who were able to identify either the upper or the lower quartile could gain a method mark, and some of these went on to complete the question correctly.

Answers: **(a)** 3, 2, 4, 6, 1 **(b)(i)** 5 **(ii)** 6 **(iii)** 4 **(iv)** 3.73 **(v)** 3

Question 8

(a) A large number of candidates did not answer this part correctly, forgetting that the 3 students who study both French and Music are included in the 8 who study French and also in the 6 who study Music. Thus, while many had the correct number, 3, in the intersection of the sets *F* and *M*, the numbers 8 and 6 were put into the outer parts of the sets respectively. A few then forgot to enter any number into the universal set to indicate the number of students who did not study either French or Music.

(b) (i) Most candidates successfully identified the region of their Venn diagram represented by $F \cap M'$ and gained the mark for the correct answer or, more frequently, for their answer of 8.

(ii) Similarly, most candidates gained the mark for answering this part correctly from their Venn diagram in spite of their error in part **(a)**.

Answers: **(b)(i)** 5 **(ii)** 13

Question 9

With a few exceptions, candidates have shown that they can usually complete the tree diagram successfully, but that many of them have greater difficulty in using it correctly.

(a) After entering the given probabilities on the correct branches, most candidates remembered that, for each pair of branches, the sum of the probabilities must be 1.

(b) Candidates recognised that they must use the fractions $\frac{1}{3}$ and $\frac{1}{10}$, but a significant number of them added these instead of multiplying them.

(c) Many candidates used the probabilities for Dave going swimming without taking into account whether or not he had gone jogging first.

Answers: **(b)** $\frac{1}{30}$ **(c)** $\frac{4}{5}$

Question 10

In general, this question was poorly answered, with candidates displaying a certain amount of confusion.

(a) (i) Very few recognised that the coefficient of *x* in the equation was the gradient of the line.

(ii) This was the best answered part of the question, with many candidates recognising that the value of *x* is 0 where the line crosses the *y*-axis and that the value of *y* at this point is given by the numerical part of the equation of the line.

(iii) Very few candidates substituted $y = 0$ into the equation of the line to find the required value of *x*.

(b) Although many candidates offered no answer to this part, the better ones recognised that parallel lines would have the same gradient and that the intercept on the *y*-axis must be –3 and wrote down the correct answer without needing to do any further work. Candidates are reminded that the complete equation requires "*y* =" at the start.

Answers: **(a)(i)** $\frac{3}{4}$ **(ii)** $(0,\ 2)$ **(iii)** $\left(-\frac{8}{3},\ 0\right)$ **(b)** $y = \frac{3}{4}x - 3$

Question 11

(a) Although most candidates were able to label the distances correctly on the diagram, they had greater difficulty with the bearings, particularly at the point *B*.

(b) While a number of candidates left this part unanswered and a few simply added the two given distances, many knew that they must use Pythagoras' Theorem to find *AC*. Once again, many answers were truncated to 5.4 or even 5 and, where no working was seen, this was not enough to gain any marks.

(c) This part was poorly answered with many different answers written in the answer space and no supporting working. Where candidates did use trigonometry as required, they often chose to use the sine or the cosine ratios using their previous answer, when the sensible choice was to use the tangent ratio and the given distances. Having found the angle at *A*, it was necessary to subtract this from 120 to find the bearing but many neglected to do this.

Answers: **(b)** 5.41 **(c)** 064

Question 12

This was a long question which covered a number of syllabus topics and it proved to be quite challenging. The value used for π continues to be an issue. Although not many candidates are now using $\frac{22}{7}$, it is still seen occasionally, as is, more frequently, 3.14. Candidates are strongly advised to use the π button on their calculator as instructed in the rubric on the front cover.

(a) The circumference was usually found successfully although answers were often seen correct to only 2 significant figures.

(b) The area of the circle was usually correct.

(c) Many candidates attempted to use trigonometry at this point when all that was required was to show that the 360 degrees at *O* was divided by 8 since *AB* was a side of the octagon.

(d) Again, no trigonometry was required here, simply the identifying of triangle *AOB* as an isosceles triangle with two equal base angles. This was done successfully by a number of candidates.

(e) Many candidates sensibly doubled their previous answer to find the size of an interior angle of an octagon but some chose to use the formula $(2n – 4) \times 90$, sometimes making an error in their working. There were also a number of guesses with unlikely answers such as 180 or 90.

(f) (i) In order to show that the length of *BA* was 6.12 cm correct to 3 significant figures, candidates were expected to use trigonometry to find this length to a greater degree of accuracy. This proved to be a challenge to most candidates and there were a number of different incorrect approaches to the problem. The best way was to use sin 22.5 with the 8 cm and obtain 3.0614... for half the length of *BA*, giving 6.122...cm as a final answer.

(ii) In this part, candidates were expected to use the length given for *BA* in the previous part to find the perpendicular height of the triangle and thus its area. The better candidates were able to do this, but many others used 8 cm instead of the perpendicular height and, once again, many omitted to answer this part.

(iii) Most candidates who had an answer to part **(f)(ii)** correctly multiplied it by 8 to obtain this answer.

Answers: **(a)** 50.3 **(b)** 201 **(c)** $\frac{360}{8}$ **(d)** 67.5 **(e)** 135 **(f)(ii)** 22.6 **(iii)** 181

Question 13

Familiarity with the functions of the calculator was essential in this question and there was evidence that many candidates lacked this, since a significant number did not attempt the question. Of those who did, many gave better answers to the first two parts than to the final two parts.

(a) There was some excellent sketching. A number of candidates appeared to plot points, which is unnecessary in a sketch, particularly when they marked one of the three intercepts on the *x*-axis at a clearly wrong point (6, 0) instead of (5, 0). It was apparent from some of the sketches that not all candidates had set the ranges on their calculator window correctly.

(b) (i) Many candidates answered this part correctly although, once again, the third point appeared quite frequently as (6, 0).

(ii) Very few candidates scored full marks in this part, with the most common error being that values were not given correct to 3 significant figures. Sometimes one co-ordinate was given sufficiently accurately but not the other. The many approximate answers, for example (–3, –15) did not gain any credit and some candidates confused the *x* and the *y* co-ordinates, writing (–15, –3).

(c) Few candidates realised that this part was asking for the smallest possible value of the function when *x* is negative and that this would be the *y* co-ordinate of their previous answer.

Answers: **(b)(i)** (–6, 0) (0, 0) (5, 0) **(ii)** (–3.51, –14.9) **(c)** –14.9

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/41
Paper 41 (Extended)

Key Messages

Candidates should remember to show sufficient working in order to gain method marks.

The general instruction is that answers should be given correct to three significant figures unless the answer is exact or the questions states otherwise. Money answers should be to the nearest cent, again unless the question says otherwise. This means that candidates may lose marks if answers are given to a lesser degree of accuracy.

Candidates should be familiar with the expected uses of a graphics calculator. This is both for graphical questions and statistical questions

Candidates are advised to use the mark value indicated in the question as an indicator of how much work is required for a question.

General Comments

The paper proved accessible to most of the candidates, but certain questions proved very difficult for all but the very best candidates. Nevertheless, marks across a substantial range were seen and the work from the best candidates was very impressive indeed. Although very low marks were rare, there remain a few candidates at the lower end of the scale, where an entry at core level would have been a much more rewarding experience.

There was evidence from some candidates of unfamiliarity with the use of a graphics calculator. In particular the statistical functions were often not used and candidates found difficulty with the later parts of **Question 15**.

Most candidates showed sufficient working but there were a significant number who produced answers without justification. The penalties for this are twofold. For certain questions, working is required to get full marks; on others, whilst full marks are available without working, they depend on an accurate correct answer and no method marks are available if the answer is not correct.

Time did not appear to be a problem for candidates as almost all finished the paper.

Comments on Specific Questions

Question 1

Most candidates were able to gain at least some of the marks on this question. There was some confusion between mode, median and mean and some candidates gave the range as the difference between the frequencies, 16 – 1 = 15, instead of the difference in the marks 10 – 0 = 10. The interquartile range created the most problems. Most candidates identified the upper quartile as 8 but very few the lower quartile as 4.5. The graphics calculator would have helped here.

Answers: **(a)** 8 **(b)** 10 **(c)** 6 **(d)** 4.5 **(e)** 5.375

Question 2

This question was well done by many candidates. The most commonly correct method was elimination, but a number were successful with the substitution method. Just a few made y the subject of both equations and used their graphics calculator. Candidates using the last method must remember that they are expected to show the sketches of the two graphs. In both the first two methods the most common errors were sign errors.

Answer: $x = 1.5$, $y = –2$

Question 3

Although many candidates did part **(a)** well, many found difficulty with the number of zeros and occasionally only used 60 instead of 3600. In part **(b)** most candidates understood that it was necessary to divide distance by speed. The most common error was to use 260 m as the distance instead of 264.5 m. A few added the 4.5 m twice giving 269 m. Some candidates did not use their answer to part **(a)** but started again with 72 km/h. These candidates were rarely successful.

Answers: **(a)** 20 m/s **(b)** 13.225 s

Question 4

Many candidates showed a sound understanding of transformations here. In part **(a)** most candidates recognised the reflection but a few had difficulty with, or omitted, the equation of the mirror line. Most candidates were able to carry out the rotation in part **(b)** although a few used the wrong centre or rotated anti-clockwise. Fewer candidates were successful with part **(c)** with many considering it as a rotation. Middle and high ability candidates usually recognised the reflection but the equation of the mirror line proved more difficult than in part **(a)**. A few candidates, in parts **(a)** and **(c)**, gave a combination of transformations. Candidates should be aware that if the word 'single' is emboldened, no marks will be awarded if they give a combination of transformations.

Answers: **(a)** Reflection in $x = –1$ **(c)** Reflection in $y = x + 7$.

Question 5

In part **(a)** most candidates showed a clear understanding of variation here and were able to score at least some of the marks. Those who used the correct variation were almost all able to get part **(i)** correct. Some struggled with the rearrangement of the equation required in parts **(ii)** and **(iii)** and some left k in their answer to part **(iii)** despite evaluating it correctly in part **(i)**. Part **(b)** proved more difficult. It was expected that candidates would use the x-intercepts to start with $y = a(x – 2)(x + 4)$ and then use (0, 24) to find a. Many who used this approach omitted the a altogether but a number were successful. Many started with $y = ax^2 + bx + c$ and, despite this more difficult approach, a number were successful. A fairly large proportion at least recognised that $c = 24$. Some candidates spoiled otherwise good work by omitting y from their equation.

Answers: **(a)(i)** 3 **(ii)** 0.36 **(iii)** $x = \dfrac{225}{y^2}$ **(b)** $y = –3(x – 2)(x + 4)$

Question 6

There was some excellent work on sets and Venn diagrams here. Part **(a)** was usually correct. Most candidates were successful with part **(b)**, many obtaining full marks and almost all gaining some credit. Some candidates inserted elements twice. This led to loss of marks both here and in later parts as, even on a follow through basis it is often impossible to award the marks. A few made errors in filling in all six members of $(A \cup B \cup C)'$. Part **(c)** was well done by most with occasional omissions or extra elements. Part **(d)** was less well done as many did not understand the notation and gave further lists of elements instead of the number in the set. Just a few added the elements in the set together.

Answers: **(a)** A = {1, 2, 3, 4, 6, 12} B = {1, 2, 3, 6} **(c)(i)** {1, 2, 3, 6} **(ii)** {11, 13, 14}
(iii) {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15} **(d)(i)** 6 **(ii)** 15

Question 7

Part **(a)** was less well done than the rest of the question. Many candidates simply found the volume of the box and divided by the volume of a ball. That said, better candidates did it well. Parts **(b)**, **(c)** and **(d)** were all extremely well done. The most common errors were using the wrong formula for the volume of a sphere and only giving answers correct to two significant figures. Part **(e)** was usually correct although, here too, accuracy was sometimes a problem. Some weaker candidates divided the wrong way.

Answers: **(b)** 14.1 cm^3 **(c)** 283 cm^3 **(d)** 2.83×10^2 **(e)** 52.4%

Question 8

Almost all candidates gained some success here. Part **(a)** was very well done. Part **(b)** was less well done with rhombus being the most common wrong answer. In part **(c)**, more candidates were successful with part **(i)** than with part **(ii)** where many repeated their answer to part **(i)** or gave *OAB*.

Answers: **(a)(i)** 64° **(ii)** 26° **(iii)** 64° **(b)** Kite or Cyclic Quadrilateral **(c)(i)** *OAP* **(ii)** *OXA* or *OXB*

Question 9

Parts **(a)** and **(b)** were done extremely well. The most common error was in part **(b)(i)** where many candidates did not appreciate that the mean of discrete information is not necessarily discrete and wrongly rounded their answer to 4. Part **(c)** was less well done, with many candidates unable to use their graphics calculator to find the equation of the regression line. Many drew a line of best fit by eye and found the equation of that. Here too, many lost one or two marks through not giving their answers to at least three significant figures. Since part **(ii)** was marked on a follow through basis, the mark was usually obtained.

Answers: **(a)(ii)** Positive **(b)(i)** 4.4 **(ii)** 98 **(c)(i)** $y = 15.1x + 31.7$ **(ii)** 92.0

Question 10

In part **(a)**, the vast majority knew to use the Cosine Rule and many achieved the correct answer. A common error was to follow $10625 - 10400\cos 72$ with $225\cos 72$. Part **(b)** was also well done but there was some evidence of confusion with the three letter angle as to which angle was required. Most candidates used the Sine Rule but occasional longer methods were seen. In part **(c)** almost all candidates were able to use $\frac{1}{2}bc\sin A$ to find the area of the top triangle but many used the non-included angle for the bottom triangle to give $\frac{1}{2} \times 86.1 \times 64 \times \sin 58$ instead of working out the third angle, 82.9°. A number of candidates used somewhat longer methods by calculating *AD* first. Accuracy was a problem for some candidates throughout this question and there was some evidence of calculators being set to radians.

Answers: **(a)** 86.1 m **(b)** 39.1° **(c)** 5210 m^2

Question 11

This question was well done by most candidates with almost all gaining a number of marks. There was some confusion over Compound and Simple interest with a number of candidates using compound interest in part **(b)** and a few using simple interest in part **(a)**. A number gave answers with no working. In part **(a)(ii)** most candidates used logarithms, but some were successful by trial and improvement. Some candidates gave 7 or 7.33 after a correct calculation rather than the required 8.

Part **(c)**, as expected, proved the most difficult part. The most common error was to equate 3000×1.04^n to $3000n \times 0.05$ instead of $3000 + 3000n \times 0.05$. Just a few used their graphics calculator and showed sketches. The most common successful method was trial and improvement. Many did not realise that logarithms were inappropriate here.

Answers: **(a)(i)** \$3374.59 **(ii)** 8 years **(b)(i)** \$3450 **(ii)** 7 years **(c)** 12 years

Question 12

Most candidates knew what was require from a tree diagram but the vast majority considered the situation as 'replacement' and replicated the probabilities on the first two branches onto the Bag 2 branches. This led to only the method marks being obtained in the later parts.

In part **(b)(i)** the method was usually correct. In part **(b)(ii)** many candidates gained the method mark for the probability of red followed by blue but many omitted the probability of blue followed by red.

Part **(c)** proved more difficult. Many found the probability of red followed by red but many either omitted the probability of blue followed by blue or used red followed by blue.

Answers: **(a)** $\frac{4}{10}, \frac{9}{11}$ $\frac{2}{11}, \frac{8}{11}$ $\frac{3}{11}$ **(b) (i)** $\frac{54}{110}$ **(ii)** $\frac{44}{110}$ **(c)** $\frac{66}{110}$

Question 13

There was some impressive algebra shown by many candidates here. In part **(a)**, those who started with the correct Pythagoras statement were usually able to complete the simplification although there were some sign errors. Relatively few followed e.g $(6x + 1)^2$ with $36x^2 + 1$. A few did not recognise that Pythagoras' Theorem was necessary.

Part **(b)** should have been more straightforward and for many it was. Some produced brackets containing fractions, which was not acceptable and some just factorised the first two terms.

Some candidates solved $7x^2 – 24x – 16 = 0$ using the formula. Even those who were successful were usually unable to transform their solution into the correct factors. Part **(c)** was well done by many but many left expressions for the area in terms of x rather than using the solution to the equation, $x = 4$. Most candidates were able to start with $y(y + 2) = 84$ but some omitted the brackets. A number could not proceed to $y^2 + 2y - 84 = 0$ and some tried to use linear equation techniques. Many candidates successfully used the formula, completing the square or using their graphics calculator to solve the quadratic equation.

Answers: **(b)** $(7x + 4)(x – 4)$ **(d)** 8.22

Question 14

This proved a very difficult question. Most were able to get a correct expression in part **(a)** but often spoilt it with poor fraction work e.g. $\left(\frac{1}{6}p \times q\right) \div 2 = \frac{1}{6}p \times \frac{1}{2}q$. This type of mistake was often repeated in later parts.
Part **(b)** was often left blank and few could use simultaneous equations and algebra to prove the result. Many candidates were able to find a correct expression for the area of grass but the algebra and fraction work involved in simplifying usually proved too difficult. Similarly, many were able to find a correct expression for the area of the vegetables in part **(d)** but very few could simplify the ratio.

Answers: **(a)** $\frac{1}{6}pq$ **(c)** $\frac{21}{32}pq$ **(d)** 17 : 63

Question 15

In part **(a)(i)** many candidates were able to get at least the asymptotes $x = 1$ and $x = 3$ but far fewer reached $y = 1$ as the third. In parts **(ii)** and **(iii)** many candidates could use their graphics calculator to find the maximum and minimum turning points but many of them lost all or some of the marks through omitting to give the answers correct to three significant figures. Only the better candidates could go on to use their answers to parts **(a)(ii)** and **(iii)** to answer part **(b)**. Only the very best candidates realised that it was necessary to both solve f(x) = 0 and use the asymptotes to solve the inequality. Some produced part of the solution but very few all three parts.

Answers: **(a)(i)** $y =1$, $x = 1$, $x = 3$ **(ii)** (1.73, –13.9) **(iii)** (–1.73, –0.0718) **(b)(i)** $–13.9 < k < –0.0718$
(ii) –13.9, –0.0718 **(c)** $x < –3$, $–1 < x < 1$, $x > 3$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/42
Paper 42 (Extended)

Key message

Full coverage of the syllabus is necessary to succeed as candidates are expected to answer all questions on the paper.

Certain functions on the graphics calculator are listed in the syllabus and these will usually be tested in the examination. The possible uses of the graphics calculator extend beyond curve sketching and candidates benefit from using this type of calculator throughout the IGCSE programme. Reference will be made in the comments on individual questions where candidates could have used the calculator but appeared to believe that this would not be allowed. Functions on the graphics calculator, such as equation solver, which are not included in the 0607 syllabus, should be used with caution as candidates will run the risk of losing method marks.

Communication and suitable accuracy are also important aspects of this examination and candidates should be encouraged to apply good practice throughout the paper, taking notice of any special instructions in individual questions.

General comments

Almost all candidates were well prepared for the examination and were able to attempt all or most of the questions. The presentation of work was usually clear and methods often fully shown.

Topics on which questions were well answered include percentages, transformations, curve sketching, two variable statistics, mean from a continuous distribution, probability, sine and cosine rules and functions.

Topics which the candidates found difficult appeared to be time and speed, domain and range, symmetry of graphs, interpreting statistics, area of compound shape, algebraic fractions and similar triangles.

The sketching of graphs continues to improve although the use of graphics calculators elsewhere is often not seen.

Almost all candidates were able to finish the examination in the time allowed.

Comments on specific questions

Question 1

(a) (i) This reverse percentage question was well answered. A small number of candidates demonstrated a need for more work on percentages, especially the recognition of which quantity is 100%. A few candidates were confused by the “every five years” situation.

(ii) This exponential increase question was well answered. Candidates showed good understanding of this type of question. As in part **(i)** a few tried to split the “every five years” into single years. The answer to this part was exact and so the full six figure answer was required and most candidates did this correctly.

(b) This question required candidates to identify when a value, increasing exponentially, would reach another value. This was a more challenging question but many candidates were successful, often by trial and improvement rather than by logarithms or by using the graphics calculator. Again a few candidates were confused by the "every five years" context.

Answers: **(a)(i)** 40 000 **(ii)** 521 284 **(b)** 2035

Question 2

(a) The description of the given transformation was very well answered.

(b) This description of two combined transformations was also well answered.

(c) The drawing of a stretch was more demanding and a good discriminating question. There were many correct answers. The most common error was to use the base of the triangle as the invariant line and a less frequently seen error was to use the *y*-axis as the invariant line.

Answers: **(a)** Rotation, anticlockwise 90˚, about (0, 0) **(b)** $\begin{pmatrix} 7 \\ k \end{pmatrix}$, $y = \frac{1}{2}k + 3$

Question 3

(a) The average speed was successfully calculated by many candidates. A number of candidates demonstrated the need for more practice with units of time as 9h 25min was treated as 9.25 hours. Some other candidates had some difficulty in finding the difference between two times on a 24-hour clock.

(b) This second average speed question was found to be more challenging as a time and distance had to be recognised. Some candidates found the average of two speeds.

(c) This money question was quite well answered. The context of rate of fuel measured in litres per 100 kilometres was not familiar to all candidates, resulting in incorrect operations involving the litres and kilometres. The answer was exact to two decimal places and a number of candidates rounded their correct answer.

Answers: **(a)** 82.8 km/h **(b)** 58.2 km/h **(c)** 99.96 euros

Question 4

(a) Almost all candidates gave a correct sketch of the cubic function.

(b) The local turning points were well answered.

(c) This part required candidates to find when f(x) = k had three different solutions. This proved to be a more searching interpretation of the sketch and many candidates who showed the ability to produce a good sketch found this question difficult. A few candidates gave the correct limits for the inequality but did not give a strict inequality. Quite a number of candidates omitted this part.

(d) This description of the symmetry of the cubic graph proved to be the most demanding part of this question. Candidates do need to have full experience of the requirements of the use of a graphics calculator when sketching functions. This experience should go beyond sketching, zeros and turning points. The stronger candidates were able to give an accurate description of the symmetry or a partially correct description. Quite a number of candidates omitted this part.

(e) The equation of the given translation of the function was generally well answered. A few candidates changed more than just the constant term of the equation and, as in parts **(c)** and **(d)**, quite a number of candidates omitted this part.

Answers: **(b)** (0, 6), (2, 2) **(c)** $2 < k < 6$ **(d)** Rotational, order 2, about (1, 4) **(e)** $y = x^3 - 3x^2 + 4$

Question 5

(a) The completion of the scatter diagram was carried out correctly by all but a few candidates.

(b) The type of correlation was also almost always correctly stated.

(c) (i) The mean was correctly stated by almost all candidates.

(ii) This mean was also correctly stated by almost all candidates.

(d) The correct regression equation was given by many candidates, indicating an improvement in this part of the syllabus. A few candidates appeared to be unfamiliar with this topic as they gave the equation of their line of fit.

(e) Most candidates correctly substituted the given value into their equation in part **(d)**.

Answers: **(b)** positive **(c)(i)** 63.6 **(ii)** 42 **(d)** $1.04x - 24.4$ **(e)** 58 800

Question 6

(a) The Pythagoras' Theorem calculation was correctly completed by all but a very small number of candidates.

(b) This "show that" question involving trigonometry to find an angle was generally well answered. A number of candidates performed a correct calculation but did not write down an answer which rounded to the answer to be shown. The wording of this question should indicate to candidates that all working must be shown together with an answer to a greater accuracy than the one given.

(c) The compound area was generally well answered, usually by adding two triangles to a sector.

(d) The context in this part was much more demanding than in part **(c)**. The answer to part **(c)** needed to be multiplied by 2, for the two sides of the fence panel, and also by the number of panels. In addition to this the area had to be converted into square metres and finally a division was required to find the number of litres required to paint both sides of the fence. There were some very good answers seen. There were also many answers which gained partial credit as they only missed one of the several steps involved.

Answers: **(a)** 150 cm **(c)** 25 300 cm^2 **(d)** 6.74 to 6.75 or 7

Question 7

(a) Almost all candidates earned some or all of the marks for drawing the straight lines and indicating the correct region. The lines parallel to the axes were found to be particularly straightforward. A number of candidates appeared to lack practice with lines not parallel to axes.

(b) (i) This part was for candidates to identify a value in the region in part **(a)** and was dependent upon an accurate region. It was correctly found by many candidates. Quite a number had a correct region but did not give the appropriate value of y.

(ii) This part required the greatest value of $x + y$ in the region and more candidates found this difficult. The stronger candidates, experienced in this topic, answered correctly.

Answers: **(b)(i)** 6.5 to 6.7 **(ii)** 7.2 to 7.6

Question 8

(a) (i) This part together with part **(ii)** demonstrated that many candidates can carry out statistics calculations without a full knowledge of the data they are working with. This part asked for an example of discrete data. There were many good answers. There were also many examples of continuous data offered and quite a large number of omissions.

(ii) This part, asking for an example of continuous data, was much more successful. There was still quite a high rate of omissions.

(b) (i) Identifying the modal interval was much more successful. A few candidates combined intervals into one larger one.

(ii) Identifying the interval containing the median was also correctly answered by a large number of candidates.

(iii) The estimate of the mean was generally well answered, often without using the statistics facility on the graphics calculator, when a lot of working was seen for only 2 marks. A number of candidates did not use the mid-values of the intervals but added or subtracted 0.05 to the mid-values or used the interval widths.

(iv) This part required some explanation of why the mean was only an estimate and there was a large range of explanations, many of them very clear and concise. As in part **(a)** there was a number of candidates who had been successful in the other three parts in part **(b)** but demonstrated a need for a greater understanding of statistics in addition to the technical processes.

Answers: **(b)(i)** $160 < h \leqslant 165$ **(ii)** $165 < h \leqslant 170$ **(iii)** 166

Question 9

(a) The probability tree was correctly completed by almost all candidates. The context was quite demanding as the middle branches had a different denominator to the others. A few candidates did find this aspect difficult.

(b) (i) This combined event involving a single product of probabilities was well answered.

(ii) This part, requiring considerable interpretation and the sum of two products, was very well answered.

(iii) This part was more complicated with four possible ways of the outcome happening. It was very well answered by many candidates and many other candidates did earn partial credit. A few candidates found the context too demanding and, overall, this part proved to be a good discriminating part of the whole probability question.

Answers: **(a)** $\frac{4}{10}, \frac{2}{10}, \frac{4}{10}$; $\frac{5}{11}, \frac{2}{11}, \frac{4}{11}$; $\frac{5}{10}, \frac{2}{10}, \frac{3}{10}$ **(b) (i)** $\frac{4}{121}$ **(ii)** $\frac{32}{110}$ **(iii)** $\frac{189}{605}$

Question 10

(a) The sketch of the tangent graph was reasonably successfully answered. Many candidates drew three correct branches but without the accuracy expected. There were often large gaps or overlaps where there would be asymptotes and the intersections with the x-axis were often unclear. Although the asymptotes were not required on the sketch, those candidates who included them usually scored full marks. There was a small number of candidates who had problems with the degree units. Candidates do need to be fully experienced in sketching as many marks depend on the first stage of this type of question.

(b) The solutions to this given equation were often correctly answered. A number of candidates did not give both answers correct to three significant figures.

(c) The correct asymptotes were recognised by many candidates. A few candidates gave answers very close to the exact values, suggesting a need to interpret values given by their calculator, and quite a number omitted this part.

(d) The modulus of the function in part **(a)** was generally well sketched. Many candidates did only earn partial credit for the same reasons as outlined in part **(a)**. Candidates were expected to use their sketch of part **(a)** or to type the modulus function into their calculator.

Answers: **(b)** 38.2, 218.2 **(c)** $x = 60$, $x = 240$

Question 11

(a) (i) Almost all candidates used the sine rule correctly, which earned some of the marks. A large number overlooked the fact that the required angle was obtuse and lost the final marks.

(ii) The cosine rule was used by almost all candidates and, as in part **(a)**, most candidates scored some marks. The most common cause of incorrect answers was sign errors when rearranging the working towards finding the cosine of the angle. A few candidates found one of the other angles in the triangle.

(b) The shortest distance from a point to a line continues to be a real challenge to many candidates and many simply omitted this part. The fact that only 2 marks were available should have indicated that only a short method would be required. The stronger candidates drew the appropriate perpendicular which immediately gave them access to a straightforward trigonometry calculation.

Answers: **(a)(i)** 116.8 **(ii)** 42.4 **(b)** 21.1 to 21.3 m

Question 12

(a) This compound function evaluation question was correctly answered by most candidates. A few found g(f(x)) and a few others made numerical errors.

(b) (i) This compound function expression was also very well answered by most candidates. A few slips were seen in the removal of brackets.

(ii) The inverse function was also very well answered. Incorrect answers were usually from sign errors, rather than any misunderstanding.

(c) (i) This part tested algebraic skills in factorising and cancelling. It proved to be the most demanding part of the whole question. The candidates who realised that the denominator needed to be factorised first usually succeeded in reaching the correct answer. A few did the factorising and cancelling correctly but gave the answer as x + 1 when this should have been the denominator. The candidates who were not strong in algebra cancelled parts of the numerator and denominator which were not factors.

(ii) This part tested the subtraction of two algebraic fractions and was only slightly more successful than part **(i)**. Almost all candidates demonstrated good knowledge of the required process and gained at least partial credit. Most of the incorrect answers were the result of errors in multiplying out brackets. Candidates should be advised that there is no need to multiply out the brackets in the denominator.

Answers: **(a)** 4 **(b)(i)** $\frac{6}{20x-7}$ **(ii)** $\frac{x+2}{5}$ **(c)(i)** $\frac{1}{x+1}$ **(ii)** $\frac{26x-13}{(4x+1)(5x-2)}$

Question 13

This question involving similar triangles proved to the most challenging part of the whole examination and an appropriate discriminator to be at the end of the paper.

(a) The explanation of why two triangles were similar was found to be demanding. Many candidates earned one of the 2 marks as they did not offer reasons for angles being equal. Others were not precise about their angles, usually by using single letters instead of three.

(b) (i) This calculation of a side of one of the triangles was the most successful part of this question and there were three pairs of similar triangles available to be used. The stronger candidates were able to use two correct ratios and go on to find the required length correctly. Many candidates found it difficult to find two ratios equal to each other suggesting uncertainty about which pair of triangles to use. Most candidates, whether successful or not, understandably attempted to use the pair of triangles from part **(a)**.

(ii) The ratio of the areas of the two triangles in part **(a)** was required. Many candidates found it difficult to find the ratio of a pair of corresponding sides, when the 4cm and 6cm should have been seen as possibly the best ones to use. A few candidates gave the ratio of the sides without squaring it and a few others gave a two significant figure decimal. This part was omitted by quite a large number of candidates.

(iii) This part was a final discriminator and only the stronger candidates succeeded in finding a suitable strategy. Many tried to actually calculate the heights of the triangle and the parallelogram and lost accuracy when attempting to find the fraction. A large number of candidates did not attempt this part.

Answers: **(b) (i)** 4.8 cm **(ii)** $\frac{4}{9}$ **(iii)** $\frac{4}{30}$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/43
Paper 43 (Extended)

Key message

Full coverage of the syllabus is necessary to succeed as candidates are expected to answer all questions on the paper.

Certain functions on the graphics calculator are listed in the syllabus and these will usually be tested in the examination. The possible uses of the graphics calculator extend beyond curve sketching and candidates benefit from using this type of calculator throughout the IGCSE programme. Reference will be made in the comments on individual questions where candidates could have used the calculator but appeared to believe that this would not be allowed. Functions on the graphics calculator, such as equation solver, which are not included in the 0607 syllabus, should be used with caution as candidates will run the risk of losing method marks.

Communication and suitable accuracy are also important aspects of this examination and candidates should be encouraged to apply good practice throughout the paper, taking notice of any special instructions in individual questions.

General comments

Almost all candidates were well prepared for the examination and were able to attempt all or most of the questions. The presentation of work was usually clear and methods often fully shown.

Topics on which questions were well answered include transformations, co-ordinates and column vectors, curve sketching, linear sequences, sine rule and cosine rule and area formula, mean and cumulative frequency, probability and functions.

Topics that candidates appeared to find difficult were time and average speed, percentages, interpreting curves, area of compound shape, algebraic fractions and similar triangles.

The sketching of graphs continues to improve although the use of graphics calculators elsewhere is often not seen.

Almost all candidates were able to finish the examination in the time allowed

Comments on specific questions

Question 1

(a) Many candidates correctly answered this calculation of time from distance and speed. The need for more practice in converting the decimal part of hours into minutes was demonstrated by some candidates.

(b) Candidates find the 24 hour clock together with time zone changes a demanding situation and there was a number of different answers seen as a result of these difficulties. Some candidates ignored the time difference and others added 6 hours when Santiago is 6 hours behind Paris.

(c) Most candidates were able to calculate the total distance divided by the total time. A small number of candidates found the average of the two speeds.

Answers: **(a)** 13h 35 min **(b)** 07 50 **(c)** 825 km/h

Question 2

(a) (i) Almost all candidates drew the correct rotation.

(ii) Almost all candidates drew the correct reflection.

(iii) Most candidates were able to describe the transformation correctly, although this did depend on parts **(i)** and **(ii)** being correct.

(b) The recognition and description of a stretch continues to be quite challenging. Enlargement was often given instead of stretch. A few candidates gave a combination of transformations even though "single" was emboldened in the question.

Answers: **(a) (iii)** reflection in the line $y = -x$ **(b)** stretch, factor 3, y-axis invariant

Question 3

This percentage question was more challenging than normal as a result of the context. Candidates need experience and practice with applications of percentages in addition to more routine calculations.

(a) (i) This calculation of a percentage of the selling price was generally well done, although a few candidates calculated the percentage of the cost price. The advice here is to read the question carefully.

(ii) The context in this part was particularly challenging. The word "profit" was emboldened but many candidates found the three quantities, cost price, selling price and profit, difficult to deal with. Many did earn partial credit for calculating the new percentage of the selling price.

(b) (i) This reverse percentage was often correctly carried out. A few candidates did treat the given amount as 100%.

(ii) The context proved to be a little more complicated as there was the cost of 100g of silver but the amount of silver in the ring was 22g. There was also the challenge of finding the difference between the given amount and the answer in part **(i)**. The difficulties many candidates had with this part endorses the earlier comment about the need for more practice with percentages questions involving context.

Answers: **(a) (i)** \$74.40 **(ii)** 21.7% **(b) (i)** \$132.50 **(ii)** 2.33%

Question 4

(a) This vector and co-ordinate question was often well answered. Incorrect answers were usually the result of some confusion with direction of the vectors. The given diagram was not to scale but it was given to help candidates throughout the question and the advice is that if something is provided in the paper then it should be used.

(b) The length of the vector was usually correctly calculated. A number of candidates were not familiar with the notation and did not calculate the length.

(c) The equation of the straight line was found to be quite challenging, with the gradient proving to be the difficulty. The stronger candidates did answer this question well.

(d) The co-ordinates of the midpoint were almost always correctly given.

(e) The equation of the perpendicular bisector proved to be more challenging than part **(c)**. The extra difficulties in this part were finding the gradient of the perpendicular and using the appropriate co-ordinates to find *c*.

(f) The naming of the quadrilateral also proved to be challenging with many candidates thinking that it was a rhombus or a parallelogram.

Answers: **(a)** (–4,11) **(b)** 7.21 **(c)** $y = -\frac{2}{3}x + 4$ **(d)** (3, 2) **(e)** $y = \frac{3}{2}x - \frac{5}{2}$ **(f)** kite

Question 5

(a) This "show that" question proved to be perhaps more discriminating than expected. The stronger candidates gave very good answers, showing each step clearly. This part was not an unusual situation and a typical context to set up the use of algebra and, in this case, the use of a graphics calculator. As it was a "show that" most candidates were able to move on and earn marks in other parts.

(b) Almost all candidates drew a correct sketch of the cubic function.

(c) The solving of the function equal to 20 was well done by many candidates. A number of candidates overlooked the 20 and found the three zeros, probably anticipating such a question.

(d) Only those candidates who answered part **(c)** correctly were able to choose an impossible answer and most did succeed in doing this.

(e) The use of the graphics calculator to find the maximum value and the appropriate length was generally well done.

Answers: **(c)** 2.19, 10, 22.8 **(d)** 22.8, negative width/length **(e)** 3030, 28.7 or 18.7

Question 6

(a) (i) The *n*th term of the given sequence was well answered. A few candidates gave $n + 4$ as their answer because the sequence was increasing in 4s.

(ii) This sequence involved combining the answer to part **(i)** with powers of 10 and proved to be an unfamiliar situation to many candidates. The stronger candidates answered it well.

(b) (i) The listing of the first four terms of another sequence involving standard form was well answered by many candidates.

(ii) The combining of the two standard form sequences by dividing proved to be a discriminating part to this question. Only the stronger candidates were able to simplify their answer correctly.

Answers: **(a)(i)** $4n - 2$ **(ii)** $(4n - 2) \times 10^{(n+1)}$ **(b)(i)** 2×10^{1}, 2×10^{-1}, 2×10^{-3}, 2×10^{-5} **(ii)** $(2n - 1) \times 10^{(3n-2)}$

Question 7

(a) This straightforward trigonometry in a right-angled triangle was well answered. A number of candidates chose to use the sine rule.

(b) The cosine rule was successfully applied by most candidates.

(c) The sum of the areas of the two triangles was generally well done. A few candidates took both the triangles to be right angled.

Answers: **(a)** 86.0m **(b)** 246° **(c)** 13 000m^2

Question 8

(a) The calculation of the mean was well answered, usually by doing a lot of working and not using the statistics facility on the calculator as listed in the syllabus. The allocation of only 2 marks should have been a signal to candidates that the calculator could be used.

(b) The cumulative frequency curve was generally well drawn. Most candidates had correct vertical co-ordinates. The mid-values for the horizontal co-ordinates were frequently seen.

(c) (i) The reading from the cumulative frequency curve was usually correct.

(ii) The interquartile range was also usually correct.

Answers: **(a)** 6.8 or 6800 **(c)(i)** 10 **(ii)** 1600 to 1900

Question 9

(a) (i) This similar triangle situation proved to be one of the most challenging questions on the paper. Only the stronger candidates were able to either use algebra or to find the appropriate pair of similar triangles.

(ii) Most candidates were able to use Pythagoras' theorem.

(iii) Different methods were seen for the calculation of this length. The ratio from the similar triangles was the shortest method but Pythagoras' theorem and trigonometry were also successfully applied.

(b) This part involved applying answers to part **(a)** to find the volume and surface area of a frustum. This involved finding appropriate heights and slant heights and this proved to be a real challenge to many candidates who often did not use two cones.

(i) The volume of the frustum proved to be the more accessible part and many candidates did find the difference of the volumes of two cones.

(ii) The surface area proved to be a discriminator and only the stronger candidates used relevant sloping heights of the two cones. The area of the circular base was often omitted.

Answers: **(a)(ii)** 121 **(iii)** 40.3 **(b)(i)** 38 700 **(ii)** 5140

Question 10

(a) The tree diagram was correctly completed by almost all candidates.

(b) (i) The probability that both balls were white was well answered.

(ii) The probability of one white and one red ball was also well answered. A few candidates overlooked the fact that this event can happen in two ways.

(iii) The probability of different colours was a little more challenging but well answered by many candidates, often by the longer method of finding all the combinations of different colours. The efficient method of subtracting the probabilities of the two ways of the same colour (and one of these was the answer to part **(i)**) from 1 was less frequently seen.

Answers: **(b)(i)** $\frac{1}{5}$ **(ii)** $\frac{4}{15}$ **(iii)** $\frac{32}{45}$

Question 11

(a) The shape of the rectangular hyperbola was seen on almost all scripts. The curve should have crossed the positive *x*- and *y*-axes and many candidates lost this mark by drawing their curve through the origin.

(b) The equations of the asymptotes was generally well answered, especially the vertical one. A few candidates did appear to lack experience in this part of the syllabus.

(c) The range of a function continues to be a difficult topic and this question was no exception. Only a few candidates gave a fully correct inequality and a few others gave a partially correct answer.

(d) The graph of the modulus function was well answered by many candidates, either by using their sketch in part **(a)** or by starting again with their graphics calculator.

(e) Solving the equation, using the graphics calculator, was well answered by many candidates. A few candidates did not give the required accuracy when the usual exact or three significant figures rule will apply, unless otherwise stated.

Answers: **(b)** $x = -3,\ y = -2$ **(c)** $-2 < y \leqslant \frac{1}{3}$ **(e)** $-4.75,\ -2.125$

Question 12

(a) (i) g(3) was correctly found by almost all candidates.

(ii) The substitution of the answer to part **(i)** into f(x) was also successfully completed by most candidates.

(b) (i) The compound function was often correctly answered. A few candidates made sign errors when simplifying and a few found f(g(x)) instead of g(f(x)). A small number of candidates found the product of the two functions.

(ii) This inverse function question was generally well answered. As in part **(i)**, sign errors were occasionally seen and a small number of candidates thought the question was asking for the reciprocal of the function.

(iii) The subtraction of two algebraic fractions proved to be a little more challenging. Most candidates did find the common denominator and gained some credit. The final numerator was found to be more challenging, particularly with respect to the signs.

Answers: **(a)(i)** -2 **(ii)** -7 **(b)(i)** $6 - 6x$ **(ii)** $\frac{4-x}{2}$ **(iii)** $\frac{11-13x}{(3x-1)(4-2x)}$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/51
Paper 5 (Core)

Key Messages

To do well on this type of paper, candidates need to look at the investigation in context as a whole. There are relationships between each set of staircases which could be used to solve all the questions including those that required an algebraic answer. Candidates should also remember to check their answers for arithmetical errors.

General Comments

Candidates showed some very good work and understanding of sequences. There is still more work to be done on looking at sequences through other sequences, e.g. using square numbers. The best candidates realised that they could even find the algebraic answers by looking at the links within the context of the question and without using an algebraic method.

Comments on Specific Questions

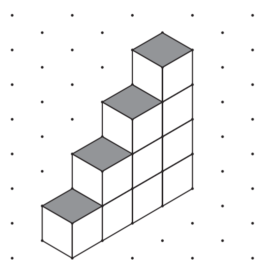
Question 1

(a) Most candidates answered this correctly showing that they had understood the introduction and could interpret the diagram.

Answer: 3

(b) Again this question was well answered as most candidates were able to construct this 3D drawing on the isometric paper provided. Diagrams that had some transparent cubes with extra lines showing were allowed.

Answer:



(c) Most candidates were able to complete this table correctly with the total number of cubes needed for staircases of heights 5 and 6 cubes.

Answer:

Height		2		4	5	6
Cubes		3		10	15	21

(d) Candidates answered this correctly by working out the pattern and continuing this until they reached the number of cubes needed. Arithmetical errors in adding-on gave occasional incorrect answers. Candidates should be encouraged to check even the simplest of calculations on their calculators.

Answer: 55

(e) (i) At this point some candidates misunderstood the question. Many gave an answer of 14 which exceeded the 100 cubes and some gave an answer of 91, which was not the height of the staircase but the number of cubes used. Many other incorrect answers again came from mistakes in calculations which should have been checked.

Answer: 13

(ii) Candidates who made a mistake in part **(i)** but correctly answered this part using their answer to part **(i)** were awarded a mark here, unless the height of their staircase was greater than 13. Those who had misunderstood and given an answer to part **(i)** of 14 gave an answer of 5 to this part. These candidates should have had an answer of −5 and then realised that this meant they did not have enough cubes since they needed 5 more. Some work on negative number in practical situations would be useful to address this misunderstanding.

Answer: 9

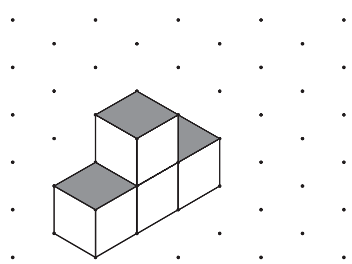
Question 2

(a) Following the thread of **Question 1**, candidates answered this question well.

Answer: 16

(b) Again this question was answered correctly by most candidates. As before, diagrams with transparent cubes and extra lines were allowed.

Answer:



(c) This table was correctly completed by most candidates. The visualisation was more difficult than in **Question 1** but candidates were well prepared in the skill of finding and continuing patterns.

Answer:

Height		2		4	5	6
Cubes		4		16	25	36

(d) Very few candidates knew the name of the sequence even though they had the correct numbers in part **(c)**. The names of some basic sequences should be learnt by all candidates.

Answer: Square numbers

(e) Candidates correctly went back to their table in part **(c)** and continued the pattern of square numbers as far as 10^2. There were a few incorrect arithmetical calculations that could have been checked on a calculator.

Answer: 100

(f) Some candidates recognised this sequence in terms of n. Most others showed that they knew how to find a sequence in terms of n by using the difference method. This was the first step on this paper away from the numerical into algebra and, even though it was quite a simple question, it was not as well answered as the numerical ones.

Answer: n^2

Question 3

(a) This was correctly answered by most candidates.

Answer: 6

(b) Most candidates worked these answers out by looking for the pattern again, as could be seen from their working. A well answered question with very few arithmetical errors.

Answer:

Height		2		4	5	6
Cubes		6		20	30	42

(c) Extension of the table in part **(b)** was the most popular method for calculating this answer. Quite a few candidates also tried to use the differences method to find the nth term, although these were less successful.

Answer: 110

(d) (i) Moving into algebra causes problems for many candidates. Most made an attempt to use the difference method or arithmetic sequence formula to answer this question and many reached the correct answer. Work on finding the nth term by using other sequences, such as sequences based on square numbers, would be really useful and help lead to an understanding of sequences.

Answer: $n^2 + n$

(d) (ii) Many candidates did not realise that they could, quite easily, find this answer by extending the table in **Question 3(b)** even further than they might have already done for **Question 3(c)**. A few tried to solve their equation of '$n^2 + n = 240$', finding that Trial and Improvement was the best method to do this.

Answer: 15

(e) Candidates found it difficult to explain this connection in the context of the investigation. Many wrote about a link using n but did not connect this to the height of the staircases nor to the number of cubes used. Work on looking at, using and explaining sequences (and the nth term) in contexts would be very useful here.

Answer: *DOUBLE staircase* = *UP AND DOWN staircase* plus height (number of steps)

Question 4

(a) More candidates saw the connection between these two staircases than the ones in **Question 3**. Many were still writing about n as in **Question 3(e)** and did not use the context of the investigation in their answer.

Answer: *DOUBLE staircase* = 2 times *UP staircase*

(b) A minority of candidates took their answer to part **(a)**, saw the connection to *n* and wrote the correct answer down. Others tried to use various methods involving sequences to find this expression. These last three parts are all about linking the algebra to a context which is what candidates will need to work on for the future.

Answer: $\frac{1}{2}n^2+\frac{1}{2}n$

Communication

Written working was required in two of the part questions chosen. Many candidates communicated throughout the paper and easily achieved this mark. Other candidates wrote very little except answers. The main example of communicating mathematically on this paper was the continuation of sequences possibly with the use of differences. More candidates should be encouraged to show in writing how they obtain each answer.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/52
Paper 52 (Core)

Key Messages

To do well on this paper, candidates were required to look for patterns and to be able to write these patterns in an algebraic form. Methods for finding the *n*th term were useful but in some cases their use hindered the candidate's ability to find very simple formulae.

General Comments

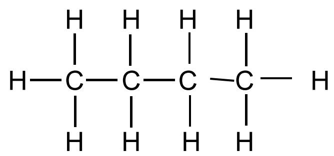
Candidates performed really well on this paper especially when they used common sense and logic to discover the patterns and links within the sequences. There is still more work to be done on sequences that include more than one variable and situations where several sequences are given together. The best candidates were those who used pattern spotting rather than more complicated working to find connections as formulae.

Comments on Specific Questions

Question 1

(a) This part was answered correctly by almost all candidates.

Answer:



(b) (i) This straightforward pattern was spotted and correctly completely by almost all the candidates.

Answer: 8 10 12 14

(ii) Most candidates were able to extend the number sequence in part **(b)(i)** without arithmetical error. Some used algebra to find the *n*th term and then calculated the answer for '*n*' = 12. Candidates should be encouraged to use the most straightforward method where possible.

Answer: 26

(iii) This question introduced the *n*th term using *c* instead of *n*. It could have been answered by looking at the pattern in the table in part **(b)(i)**. Most candidates were able to answer this correctly. Its simplicity meant that many did not write down their working and so lost a chance of the communication mark.

Answer: 2c + 2

(iv) There were many answers of 202 where the substitution of 100 for *c* instead of *h* was made. This was probably because this is what candidates expected to be asked, so reading the question most carefully can never be emphasised enough. Answers of 48 occurred when the candidates again substituted 100 for *c* but this time they were unable to calculate the algebra correctly. Work on solving simple linear equations is still needed.

Answer: 49

Question 2

(a) This question was really well answered, the simple number sequences being easy to follow.

Answer:

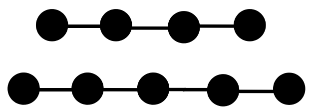
c	*h*	*o*	*t*
	8	1	12

(b) This was the first question that many candidates found difficult to answer. Those who connected '*c*' as '*n*' and ignored the *h* and *o* columns used the difference method or the pattern of the *t* column to obtain the correct answer. Candidates need practice with more than two columns in a sequence table so that they can find the '*n*th' term between different pairs of variables.

Answer: 3*c* + 3

Question 3

(a) This question was answered correctly by most candidates. A few only drew the molecule with four spheres indicating they had not read the question correctly.

Answer:
.


(b) These straightforward patterns were completed correctly by almost all the candidates.

Answer:

m	*s*	*r*
	4	3
	5	4
	6	5

(c) Some candidates gave the correct formula but in terms of *n* which was not acceptable for this answer. Some misread and gave the formula in terms of *r*. Otherwise this was another question that was well answered.

Answer: *m*

(d) Most candidates saw the connection between *s* and *r* in the table in part **(b)** and were able to answer this part correctly.

Answer: 96

Question 4

(a) Again this pair of straightforward sequences was not a problem for most candidates who worked out the patterns and completed the table correctly.

Answer:

m	*s*	*r*
	8	10
	10	13
	12	16

(b) (i) This formula did not cause a problem for most candidates other than those who were working the *n*th term and gave their answer in terms of *n*.

Answer: $2m$

(ii) Some candidates misinterpreted this question giving answers in terms of *s* or in terms of *n*. Others found it confusing dealing with two sequences in one table as in **Question 2(b)**. Candidates should work on sequences given with other letters not just working 'in terms of *n*'.

Answer: $3m - 2$

(c) Two marks for this repeated substitution meant there was one mark for the substitution of $s = 100$ into the answer for part **(b)(i)**. Many candidates did not show this working nor their answer to this substitution which meant they lost both marks for an incorrect final answer. Both answers in part **(b)** were followed through so it was still possible to achieve two marks in this part for the correct working. Common errors here were to substitute 100 for *m* instead of for *s* in part **(b)(i)** or to substitute 100 for *m* or for *r* straight into part **(ii)**. This was the same as in **Question 1(b)(iv)**. Practice on substitution into the subject instead of the object of a formula is recommended.

Answer: 148

Question 5

(a) Almost all the candidates spotted the pattern in the coefficients for the number of spheres and most candidates spotted the patterns between the coefficients and the constants for the number of rods. These sequences of counting numbers and odd numbers are very simple and some candidates lost marks by looking for something more complicated or by making mistakes when trying to use the difference method.

Answer:

h	*s*	*r*
	m	
	$2m$	$3m - 2$
	$4m$	$7m - 4$
	$6m$	$11m - 6$

(b) (i) Again those candidates who used the differences method or formula to find the answers to '*n*th term' questions like this often made mistakes or got muddled with the four variables. Those who used 'pattern spotting' found it easier to write down the answer. Candidates should be advised to look for patterns first.

Answer: hm

(ii) Candidates found this question difficult to answer despite having been asked to find formulas in several different parts of this paper. Many managed to obtain the $2h - 1$ sequence for the coefficients, often after lots of working, but then ignored the m when they put this into their answer. Working with sequences including more than one variable would be good practice for this type of question as well as practice on pattern spotting.

Answer: $(2h - 1)m - h$

Communication

The communication on this paper was straightforward but too many candidates wrote answers without showing how they had achieved these answers. For pattern spotting, or even using the difference method, the repeated differences should be shown. This could have been written in on the table or in the part question space. There were opportunities to do this for **Questions 1(b)(iii)**, **2(b)** and **4(b)(ii)**. Similarly when substitution is required then the actual replacement of the letter by the number should be shown. There were opportunities to show this in **Questions 1(b)(iv)** and **4(c)**. Candidates should be encouraged to show all their thinking by writing it down as part of their working out.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/53
Paper 53 (Core)

Key Messages

To do well on this paper required candidates to look at the investigation as a whole. Questions were linked by idea and followed a pattern so that working on one grid would help towards finding the answers for questions on other grids.

General Comments

Candidates performed well on the numerical calculations on this paper showing a good understanding of individual questions. There is still much algebraic work to be done especially on multiplying out brackets and multiplying by negatives.

Comments on Specific Questions

Question 1

(a) This question was very well answered. Sometimes mistakes were made when entering the correct calculation into the calculator, but the working column correctly completed showed that these candidates had understood the pattern.

Answer: $24^2 - 3 \times 5$ 561
$25^2 - 4 \times 6$ 601
$26^2 - 5 \times 7$ 641

(b) Most candidates realised that the T-values were increasing by 40 and were able to explain this in words. Some still need practice in using words to explain rather than algebra.

Answer: Increasing by 40

(c) Candidates followed the explanation and the pattern and most successfully calculated the 'wrap around' T-value for T_9 correctly.

Answer: 801

Question 2

(a) Candidates appeared to understand the question but many had difficulty deciding where on the grid the T would be to give the greatest T-value. Some candidates misunderstood 'fits completely on this grid' and found the value of T_{79}. Calculations for a given T-value were usually correct.

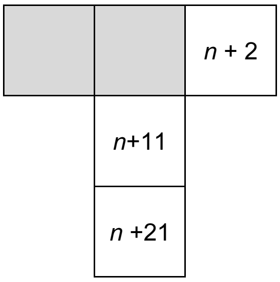
Answer: 3561

(b) This question was very well answered.

Answer: 10

(c) This was the first question based on algebra. Despite the lead into this by the last question, some candidates found it difficult to answer both parts correctly. Candidates should be encouraged to study all questions together and to look for overlaps between questions.

Answer:



(d) Very few candidates were able to multiply out the bracket squared or multiply the bracket by $–n$. The first line, started to help the candidates, gave the chance to a few to fill in the 21 and the 2 in the correct places. $(n + 21)(n + 21)$ was very rarely seen as the next line so the middle term of $42n$ was usually missing. $–n(n + 2)$ was most usually expanded to $–n^2 + 2n$. A great deal of work and practice on multiplying out brackets, of both these types, is essential.

(e) Many candidates realised that the T_n formula was given at the beginning of part **(d)**. Arithmetical errors as well as the inability to rearrange correctly resulted in an incorrect final answer for some of these candidates. Other candidates looked at continuing the sequence of adding 40. Realising that questions are linked was key to finding the easy way to answer these questions and should be emphasised when studying how to move through investigations.

Answer: 55

(f) When looking at their answers and the information given in the preceding questions many candidates realised that all the T-values ended in a 1. This was a very simple yet correct answer. Other candidates looked for something more complicated, e.g. finding that the n value for 840 was not a whole number or subtracting any already given smaller T-value from 840 and showing that the answer is not a multiple of 40. All these are valid methods using information given in earlier questions which makes looking for links between questions so important.

Answer: All T-values end in 1 or n is not an integer (= 10.05)

Question 3

(a) This question was answered correctly by most candidates.

Answer:

n							
T_n		617			749		881

(b) (i) Many candidates realised that this question, in asking for a formula in terms of n, was actually asking for the nth term.

Answer: $44n + 529$

(ii) Candidates who had found the formula in part **(b)(i)** showed by substitution of $n = 10$ that T_{10} was equal to 969. What many candidates did not realise was that to show that this is the correct result they needed to obtain the value of 969 in another way.

Answer: $44 \times 10 + 529 = 969$ and $33 \times 33 – 10 \times 12 = 969$

Question 4

Looking at patterns and comparing this question with parts of **Questions 2** and **3** gave many candidates the help they needed to get all or most of these expressions correct. This was another question in this investigation where the work on previous questions could be used to answer this.

Answer:

	$n + 1$	$n + 2$
	$n+w+1$	
	$n+2w+1$	
	$n+3w+1$	

Communication

The communication on this paper was very good. Many candidates showed their working for calculating the 'wrap around' T-value in **Question 1(c)** and those who used the formula in **Question 2(e)** showed their calculations for n.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/61

Paper 6 (Extended)

Key Messages

In order to do well in this examination, candidates needed to give clear and well thought out answers to questions, with sufficient method being shown so that marks could be awarded. Candidates should remember that good mathematical communication is being assessed in this paper and that answers alone are usually insufficient. Candidates who looked for patterns in Part **A** often produced correct solutions much more straightforwardly than those applying known methods for generating sequences or finding *n*th terms. Candidates need to realise that the use of exact fractions, rather than rounded decimals, in calculations is more likely to produce results of suitable accuracy. When a practical reason is requested, candidates need to understand that an abstract explanation, unrelated to the context, will not gain credit.

General Comments

Many candidates were well prepared for this examination and gave good, clearly presented and well explained answers. The level of communication was very good both in Part **A** and Part **B**. Many candidates scored highly and found Part **A** particularly accessible. In order to improve, other candidates need to understand that their working must be well-presented and detailed enough to show their understanding clearly. The need for this was highlighted in Part **B Question 3a(iv), 5(a)** and **5(b)**. Generally, showing clear method is also very important if a question starts with the words “Show that…” or “Describe ...”. This indicates that the answer has been given to the candidates and that the marks will be awarded for showing how that answer has been found. The need for this was highlighted in **Question 2(a)** and **3(a)(ii)** of Part **B** in this examination. Many candidates either used exact fractions or used the full values from their calculator displays and gave accurate solutions. Other candidates need to understand that prematurely approximating values in a calculation may result in inaccurate answers which are then penalised. Many candidates seemed to use their graphics calculators successfully to solve equations in Part **A** and draw the required graph in Part **B**. Candidates who used the spreadsheet function on their graphics calculator to find the expressions for the *n*th terms in Part **A** using cubic regression sometimes gave answers with very small inaccuracies. These candidates would have done better if they had considered the result their calculator produced in the context of the investigation they were undertaking. However, candidates should be reminded that using quadratic or cubic regression functions on their graphics calculator is not listed as a requirement of the syllabus and should not be used as it will gain no credit. Some candidates would also have improved if they had cross-checked their work throughout Part **A** – appreciating the connections between the patterns in **Questions 1, 3** and **4**, for example, would have enabled them to have double-checked the validity of their expressions in *n*.

Comments on Specific Questions

Part A Investigation

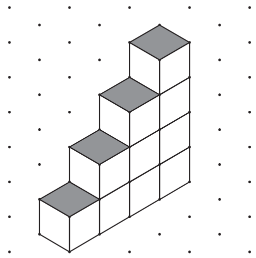
Question 1

(a) This question provided a straightforward introduction into the task. Candidates rarely made errors and the few not scoring the mark would have done better if they had read the question more carefully.

Answer: 3

(b) Again, this question was well answered, with most candidates producing 3D drawings of acceptable standard.

Answer:



(c) Candidates had a clear idea of what was expected here and even those few candidates who did not answer part **(a)** correctly recovered and correctly completed the table.

Answer:

Height		2				
Cubes		**3**		**10**	**15**	**21**

(d) Whilst most candidates seemed to have understood the pattern, some would have benefited from using simpler approaches, rather than overly complicated ones, to find the expression required. Application of the method of differences was commonly seen and well used by candidates. Those who knew that a second constant difference row of 1 resulted in the coefficient of n^2 being $\frac{1}{2}$ quickly arrived at the correct expression; those who went on to construct simultaneous equations to solve often misconstrued $2a = 2$ and so $a = 1$. Candidates who attempted trial and improvement approaches often produced work of a disorganised nature and generally had limited success in finding the correct expression. Some candidates confused finding the expression to generate the sequence, i.e. the *n*th term of the sequence, with the term-to-term rule and attempted to find recurrence relations.

Answer: $\frac{1}{2}n^2 + \frac{1}{2}n$

(e) Most candidates gave the correct value, very often by continuing the sequence, rather than using their expression from part **(d)**. Many communicated this well, showing their substitution or their continued sequence.

Answer: 55

Question 2

Candidates found this question straightforward in nature and very quickly observed the pattern as being that of square numbers with which they were clearly very familiar. Consequently, it was unusual to see an incorrect answer to any part of this question.

Answer: **(a)** 16 **(b)**

Height		2		4	5	6
Cubes		4		16	25	36

(c) n^2 **(d)** 100

Question 3

Many candidates indicated that they had observed that this pattern was simply double that given in **Question 1**. These candidates produced the correct answers to this question with greater ease than those who started again with, for example, the reapplication of simultaneous equations and so on.

(a) Very well answered, with only a few candidates making arithmetic or possibly counting errors.

Answer:

Height		2		4	5	6
Cubes		6		20	30	42

(b) Many candidates again communicated method by showing differences. Some candidates wrote "using GDC" in the working space. These candidates should be aware that this does not count as evidence of communication. Candidates found this expression marginally easier to find than that in **Question 1** and it was a shame that they did not compare the answers to these questions to correct any errors in their answers to **Question 1**.

Answer: $n^2 + n$

(c) Again, most candidates found the correct value, often by continuing the sequence correctly, and again many candidates communicated this very well.

Answer: 110

(d) Many correct answers were seen, although there was often very little method offered. Some candidates used an approximate method, such as $n = \sqrt{240}$, and gave a decimal answer. Whilst methods such as this are useful, candidates should be aware that they do only produce approximations of the answer and that, in this context, the answer should have been a positive integer. A common misunderstanding was that the height of the staircase was 240 i.e. $n = 240$.

Answer: 15

Question 4

Again, many candidates showed very good spatial awareness and indicated that they had observed that this pattern was simply n times that given in **Question 1**. These candidates again produced the correct answers to this question with greater ease than those who started again with, for example, the reapplication of simultaneous equations and so on.

(a) This proved to be the first part to challenge many candidates. A common incorrect answer was obtained by increasing the first differences by 7. Those considering the links between the questions in this investigation obtained success much more easily in this part.

Answer:

Height				4	5	6
Cubes				40	75	126

(b) A good number of correct expressions, some unsimplified, but nonetheless correct were seen. There were more expressions seen here that had clearly been found using the graphics calculator and that had some sort of regression residual included. As previously stated, candidates may need reminding that using quadratic or cubic regression functions on their calculator will gain no credit. Some candidates communicating the difference method truncated their differences and only had 2 constant differences in the 3rd row, rather than the necessary 3 constant differences.

Answer: $\frac{1}{2}n^3 + \frac{1}{2}n^2$

Question 5

A good number of candidates found the correct row for the *double staircase*. Only the best candidates tended to score all 3 marks here. Even those with the three correct expressions, or 3 follow through expressions of the correct order, found this a challenge. Many were attempting trials rather than the neater and simpler method of solving equations. Some candidates needed to read the table headings more carefully, as they gave the number of cubes used rather than the number of cubes left over. Some made a similar error in misunderstanding as they did in **Question 3(d)** and gave answers far in excess of 1800. There were a small number of candidates scoring 2 or 3 marks and this was rarely from a follow through expression. Those candidates who were trying to work with recurrence relations almost always did not score in this part. Although a great deal of working space was provided, few candidates utilised it to communicate their method.

Answer:

Type of staircase	Max height using 1800 cubes	Number of cubes left over
UP	59	30
DOUBLE	41	78
MULTIPLE	15	0

Part B Modelling

Question 1

(a) Candidates who converted their fractions to decimals and rounded occasionally made premature approximation errors in this part. If they successfully rounded their approximate answer to 40, they were allowed the recovery, but inaccurate answers were not credited.

The majority of candidates gave the exact, correct answer. Most candidates communicated a useful method in this part.

Answer: 40

(b) Well answered again by most candidates. Again, a high proportion communicated a sensible method in this part. Occasional answers of 360 km were given and candidates who arrived at this answer would have done better had they considered the likelihood of such a distance in the given time.

Answer: 6

Question 2

(a) This question required candidates to show a given result. Many did so with an acceptable method or by stating an acceptable decimal. Some candidates were unsure of the relationship between the time, distance and speed, whilst others worked with the velocity of the boat in still water and seemed unsure of what effect the current had on the velocity of the boat. The haphazard thinking of some candidates was displayed in the scattered presentation of their answers.

(b) A high proportion gave a correct form of the answer. A few candidates prematurely approximated and gave their answer as 4.3, without a more accurate answer having been seen. Candidates would improve if they gave a more accurate answer before rounding, or if they used correct recurring decimal notation. Some candidates used the approximate figures from part **(a)** in this part, which was condoned although, technically, not a useful approach. Candidates need to be aware that improper fractions are not acceptable answers to questions in context, though exact mixed numbers are acceptable.

Answer: $4\frac{1}{3}$

(c) A good number of fully correct answers, supported by correct methods were seen. A few more premature approximation errors were apparent in this question. If candidates rounded sufficiently, following such an error, they were allowed to recover, if not, they were penalised.

Answer: $13\frac{1}{30}$

Question 3

(a) (i) Few candidates gave the correct pair of partial fractions here. Many were working back from the answer given in part **(a)(ii)** or trying to explain what each element represented in part **(a)(ii)**. This was not a useful approach.

Answer: $\frac{20}{v+2}+\frac{20}{v-2}$

(ii) Again, this was a question where candidates were required to derive a given result. Many candidates, including some of the more able candidates, gave insufficient evidence. Although the calculations were simple enough to be done mentally, when candidates are asked to show that a given answer is correct, they need to realise that they must show sufficient and clear method. In this question, that meant showing the derivation of the numerator and the denominator of the algebraic fraction given, by starting from a correct pair of partial fractions, combining them with a common denominator of $(v + 2)(v - 2)$ and a numerator of $20(v - 2) + 20(v + 2)$.

(iii) Many candidates drew graphs with the right branch only. This was condoned, provided that a practical reason justifying this was given in part **(a)(iv)**. Most candidates seemed able to use their graphics calculators to produce a graph of sufficient accuracy with both branches. Some left a gap at the origin and the gap between the branches of some solutions was rather large. Candidates who did not gain full marks may improve if they make one or two extra checks besides using their calculator, such as checking the *y*-intercept and checking any possible asymptotes as well as checking the given scale(s) on any axis.

(iv) When asked for a practical reason, candidates would do well to reread the context of the question to assist them in their answers. Had they done so, perhaps more candidates would have given the correct value for *k* and for an acceptable reason. Few answers were seen that gave $k = 2$ and fewer that gave a suitable, practical reason. Many gave $k = 0$, 1 or a value a little greater than 2. Many gave reasons such as “At 2, the value of *T* is undefined” – not a practical reason as there is no connection to the context. The best candidates gave answers such as “$k = 2$ because otherwise the boat will be unable to move against the current”. A few candidates stated that “k = current” and these were not credited as the question specifically demands a value for *k*.

Answer: $k = 2$ and valid reason in context

(b) Well answered in general. A few candidates gave answers of 1.1 recurring, from $\frac{20}{18}$ or 2.2 recurring, from $\frac{40}{18}$, omitting to use the model given in part **(a)(ii)**. Candidates should realise that parts of questions are linked and that information given earlier may be used in later parts.

Answer: 2.25

(c) The most common answer here was 6.6 recurring, from $\frac{20}{3}$. The best candidates equated the model to 3 and solved using their graphics calculators. Some candidates misinterpreted the question and equated one leg only of the journey to 3 and solved. For good communication, it was expected that candidates would write down the equation they had set up and were attempting to solve. Some candidates did this. Other candidates wrote “using GDC” in the working space and these candidates should be aware that this does not count as evidence of communication.

Answer: 13.6

Question 4

(a) (i) Candidates who understood how the model was constructed answered this part well.

Many candidates, however, doubled the speed of the current rather than squaring it, or changed the numerator 60*v*, as well as changing the denominator. Some candidates gave numerical answers. Some candidates were unable to offer any solution.

Answer: $\frac{40v}{v^2-9}$

(ii) Candidates who gave correct solutions to **Question 3(c)** generally gave the correct solution here. A common wrong answer was 13.3 recurring, from $\frac{40}{3}$.

Answer: 13.9 – 14.0

(b) A fairly good number of correct answers from correct solutions were seen. Some candidates would have improved if they had reread the question – having correctly adjusted the model, they omitted to equate to 3 and solve. Some that did adjust the model, omitted to square root and an answer of 25, amongst those offering a solution, was not uncommon. Many candidates found this question too challenging.

Answer: 5

Question 5

(a) Candidates answered this question well, with a good proportion giving a valid and quantified comment. Some comments were too imprecise to credit. Some candidates commented on the time or speed, rather than the distance being doubled, and were not credited. Some candidates made superfluous comments besides the distance being doubled and this was generally condoned.

(b) Candidates found this question challenging. Most candidates described a translation or enlargement from the origin. Those who did describe a stretch often had the incorrect axis as being invariant. The scale factor, when given, was more often than not correct.

Answer: **(b)** Stretch, scale factor 2, *v*-axis invariant

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/62
Paper 62 (Extended)

Key Messages

A graphics calculator is required for this paper and is usually necessary when tackling any modelling tasks. Candidates are well-advised to read each question carefully. In order to be awarded communication marks, working needs to be shown. For example, the solution to an equation written directly from a graphics calculator is not sufficient to gain a communication mark.

General Comments

Candidates appeared to be well-prepared for this paper. There was evidence of confident skills in algebra and a sustained response to questions. Several fully correct scripts were seen. The majority of candidates were able to gain communication marks.

In the investigation it was noticeable that most candidates were able to handle all five variables without confusion. There was a very strong response to finding the general terms of the linear sequences, a key component for most of the investigation. There were four *Show that…* questions in this paper. This instruction requires candidates to write down significantly more than they might do when solving a problem or calculating a value and candidates should realise that all steps must be clearly shown. Sometimes it was the more able candidates who omitted steps. Several candidates, when asked to show the equality of two algebraic expressions, only substituted numerical values. Most candidates could solve a quadratic equation but, in this paper especially, a method should be shown. That method may be, for instance, factorisation or using the formula. Solutions found from a graphics calculator should be accompanied by a sketch with the relevant intercepts marked to show how the calculator was used.

In the modelling task candidates used their graphics calculator effectively. While accurate diagrams are not required for a sketch, candidates should still take care in ensuring that the general shape drawn approximates what the graphics calculator shows. It is generally a good idea to put approximate scales on the axes for such sketches as this may gain communication marks. In a modelling task, few answers are purely numerical and so candidates should be aware that, when answering in context, appropriate units are required.

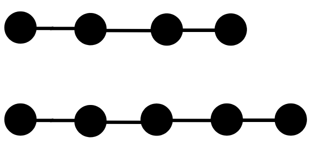
Comments on Specific Questions

Part A Investigation

Question 1

(a) This straightforward introduction to representations of molecules was answered correctly by nearly all candidates. Occasionally a candidate only drew the fourth rather than both molecules.

Answer:



(b) The continuation of the columns of consecutive integers was answered correctly by all candidates.

Answer:

m	*s*	*r*
	4	3
	5	4
	6	5

(c) Relating the equal quantities caused no difficulty for candidates. A handful of candidates related the wrong two columns and wrote $m-1$.

Answer: *m*

Question 2

(a) Nearly all candidates were able to complete the columns of linear sequences. Very occasionally a careless slip was seen.

Answer:

m	*s*	*r*
	8	10
	10	13
	12	16

(b) (i) Again, this question, finding a formula for the multiples of two, was correctly answered by nearly all candidates.

Answer: $2m$

(ii) Many candidates were able to write down the formula for the sequence 1, 4, 7, 10…. There was an opportunity for communication here and candidates should be encouraged, when finding the formulae for sequences, to show the use of differences. Some candidates gave alternative forms of the answer which were not as concise. While these were not penalised, their form made subsequent deductions more difficult.

Answer: $3m-2$

Question 3

This question was very similar to **Question 2** and so the same comments apply to parts **(a)** and **(b)**.

Answers: **(a)**

m	*s*	*r*
	12	17
	15	22
	18	27

(b)(i) $3m$ **(b)(ii)** $5m-3$

Question 4

(a) The table illustrated how the formulae themselves were part of a sequence. Most candidates identified and continued the linear sequences for the coefficients with only a few unsuccessful, owing to arithmetical error.

Answer:

h	s	r
	m	
	$2m$	$3m - 2$
	$3m$	$5m - 3$
	$4m$	$7m - 4$
	$6m$	$11m - 6$

(b) (i) The generalisation of the second column in the table was achieved by nearly all candidates. Candidates should have kept to the three variables given and not introduced further letters, such as n.

Answer: hm

(ii) This question required algebraic skill, and generalising the last column of the table required the correct use of brackets to avoid ambiguity. The majority of candidates found the correct answer and showed confidence in relating the sequences to an algebraic form. A number of candidates started afresh rather than making effective use of the patterns that could be seen in the table. Some candidates identified the pattern but could not then express the general formulae correctly and wrote $r = (2m - 1) - h$ for instance.

Answer: $(2h - 1)m - h$

(c) There were few wrong responses to the rearrangement of the formula found in part **(b)(i)**. The most common error was to swap over numerator and denominator.

Answer : $\frac{s}{h}$

(d) Many candidates gained the mark here, substituting their answer to part **(c)** into their answer to part **(b)(ii)**. Some went further and removed brackets or made a single fraction. Sometimes that resulted in unnecessary errors beyond what was required. Such errors were not penalised but resulted in difficulty in the next question. Some candidates worked out the formula without making much use of previously found results. They should have realised that questions are sequenced and so a use of earlier parts was implied.

Answer: $(2h - 1)\frac{s}{h} - h$

Question 5

(a) By this point in the investigation five variables had been introduced and so there were several candidates who were confused as to how to handle them. The question stated that candidates should use their answer to **Question 4(d)** and those who decided to use an earlier part of the investigation were unlikely to score full marks here. Successful candidates wrote $s = wh$ or $w = \frac{s}{h}$ and substituted this into their final equation in **Question 4(d)**. A very common misunderstanding in tackling this question was to think that the truth of a general equation could be shown by substituting numerical values. Such an approach receives no credit.

(b) Candidates who stated that it was possible to have a square molecule, without any explanation, received no marks here. A few candidates wrongly assumed that 544 itself had to be a square number.

Candidates were expected to use the general formula in part **(a)** to solve the problem. They had to realise that *square* implied $h = w$ and then find a method for solving the resulting quadratic equation. A methodical approach could gain a method mark but quite often responses were seen where candidates had simply tried out numbers to see if they gave 544. Such a trial and improvement approach only gained credit for method if at least three improving trials were seen. Rather than resorting to trial and improvement, a better method was to use factorisation or the formula. Many candidates did not show their method for solving the quadratic equation and thereby missed an opportunity for good communication. Those who wrote down an answer directly from a graphics calculator could not receive credit for communication unless answers were accompanied by a graph.

Answer: Yes, when $h = w = 17$.

Part B **Modelling**

Question 1

(a) Most candidates were able to plot their points with sufficient accuracy.

(b) (i) Almost all candidates wrote down the correct equation. A few omitted $y =$ and lost a mark. Occasionally a candidate found the line of regression for the initial data and could not gain credit as they had not answered the question that was stated.

Answer: $y = x + 3$

(ii) Those who answered part **(b)(i)** correctly, had little difficulty writing down the correct answer here. Most chose to use the equation, rather than the graph, to find the answer and, in doing so, there were some who confused whether x or y should be 0. In the context given, communication was expected by giving the correct units. While most gained credit for communication there were several who treated the answer as a simple numerical question.

Answer: 3 km

Question 2

(a) This question gave candidates the introduction to finding a quadratic model for the data by showing that $c = 0$. A large number of candidates failed to gain credit here because of missing steps. Candidates were expected to show that each term gave 0. In this paper communication is important and, especially in a *Show that…* question, candidates are advised not to omit even simple steps.

(b) Finding the two equations, by substituting the points into the quadratic, was successfully done by most candidates. Some candidates chose to go further and rearrange the equations, which sometimes led to errors that made a correct solution in part **(c)** impossible.

Answer: **(i)** $4a + 2b = 5$ **(ii)** $25a + 5b = 8$

(c) Good algebraic skills were seen in the solution of the simultaneous equations from the great majority of candidates. The popular, and probably easiest, method was the method of elimination, although several candidates were successful in using the method of substitution. Many gained full marks here with few resorting to a solution read directly from a calculator. There was a heavy penalty for those who wrote down an answer without apparent working.

Answer: $a = -0.3$, $b = 3.1$, $y = -0.3x^2 + 3.1x$

(d) The majority of candidates with the correct solution in part **(c)** could draw the graph of the model. Knowing the shapes of different functions is an important part of the syllabus and one that is very relevant to modelling. To ensure marks in such questions, candidates need to be aware of the shape of a parabola and not draw a semicircle or two straight lines meeting at a rounded point. Some candidates plotted individual points, which suggested they were not using a graphics calculator as required for this syllabus. There was an opportunity for good communication here by showing scales on the axes or by labelling key points.

(e) For such questions, candidates should relate the model to the context to see whether the model makes sense and is valid in the real situation. Many made statements about some individual points and the concept of validity was not properly understood by all. Many alluded to the model being inappropriate but did not actually say so. The best answers involved comments that the model could not be valid because, as the height of the viewer increases, the horizon cannot get closer as the graph suggests. Others correctly commented on the impossibility of the distance to the horizon becoming negative. Only candidates with a correct graph could score here.

Question 3

(a) Many candidates wrote down the correct equations for this model, but there were a significant number who were not careful enough in placing the powers correctly in the equations.

Answer: $5 = a \times 2^b$, $8 = a \times 5^b$

(b) Candidates were required to derive an equation from part **(a)**. Instead of deriving the equation, a very common error was to show that a solution to the given equation existed. In particular those candidates who substituted $b = 0.5$ received no credit. The correct method to derive the equation was to divide one equation by the other. In this *Show that…* question, candidates needed to show this division clearly. There were a large number of candidates who ignored the *a*s and did not demonstrate that, only under division, could they be removed.

(c) Very many candidates demonstrated a sound knowledge of logarithms and gained full credit here. Some avoided logarithms and instead used their graphics calculators to find a solution, in which case a high degree of accuracy was expected.

Answer: $b = \log_{2.5}1.6$ or $\dfrac{\log 1.6}{\log 2.5}$

(d) With *b* given as 0.5, candidates only had to substitute one of the points to find *a.* An important test for candidates in this question was to see whether they knew what to write down for a model. A large number of candidates, who evaluated *a* correctly, did not state the model and so lost the mark.

Answer: $y = 3.54x^{0.5}$

(e) A frequent error for many candidates was to compare this model with a previous model (either the linear or the quadratic model). The question however asked for comparison with the data and, with a correct model in part **(d)**, it is apparent that the model was a close fit for that data. It was expected that candidates would give more than statements about individual points; an appreciation of the overall high degree of accuracy of this model was required. Candidates should realise that no mathematical model is perfect – a close fit may not be perfect but it still implies a valid model.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/63
Paper 63 (Extended)

Key Messages

Candidates could score for unsimplified algebraic rules. However, it is normally easier to see patterns and generalise if rules are simplified.

Candidates should try to show all stages of their working when asked to *show* a model is correct. Examiners need to be convinced that candidates are working from the basic assumptions towards the model and not vice versa.

General Comments

In general, candidates scored better on the investigation section than the modelling section, with some weaker candidates giving up fairly early on in the modelling. In general, there was good evidence of communication in both sections and no evidence of candidates running out of time.

Comments on Specific Questions

Part A Investigation

Question 1

(a) For most candidates this was an accessible start to the paper with the majority able to give correct T-values. Some weaker candidates subtracted the $n(n + 2)$ portion twice but still generally managed to score one mark.

Answer: 561, 601, 641

(b) This was generally correct.

Answer: 801

(c) This was usually correct and the stronger candidates simplified their answers.

Answer: $40n + 441$

(d) Most candidates answered this correctly.

Answer: 55

(e) Many candidates found the reasoning here quite tricky and were often looking for complicated explanations rather than the quite simple observation that all T-values end in a 1.

Question 2

(a) This was usually answered correctly.

Answer: 11

(b) A few candidates made some errors in counting.

Answer:

		$n + 2$
	$n+12$	
	$n + 23$	

(c) There were many correct solutions here. A few weaker candidates thought they only had to complete the first line.

Question 3

Most candidates could go through the same process as in **Question 2(c)** to achieve a correct formula. Some weaker candidates did not simplify their formula as requested in the question and hence only scored a method mark.

Answer: $48n + 625$

Question 4

(a) (i) Only the best candidates could now extend their reasoning to a two-variable situation. They again followed the routine from **Question 2(c)** with many drawing out the T shape and filling in the entries. A few made slips in expanding the brackets and hence scored only the method mark.

(ii) There were many correct solutions but candidates could have communicated their method better here as rarely was any working visible.

Answer: 15

(b) Only the strongest candidates attempted this part.

Part B Modelling

Question 1

(a) Nearly all candidates scored here and most communicated their method clearly. A few struggled with the conversion from cm^3 to litres.

Answer: 180

(b) (i) Again the only common error was one of conversion from cents to dollars.

Answer: 131.40

(ii) Not all candidates understood that 'show that' meant they were not to use the given model and so simply demonstrated that the model gave the correct answer. Many of those that did understand struggled with the number of calculations and often left Examiners to assume what calculations had been done.

(iii) Many candidates who could not derive the model in part **(ii)** were, however, able to use it and there was often good communication of method here.

Answer: 24

Question 2

(a) Many candidates gave up at this point and so answers to this straightforward trigonometry question were quite rare. For those who did attempt this, a clear labelled diagram would have helped with accuracy.

(b) There were only a few correct answers to this question. In fact, only a small number of candidates were able to use the given formula for the area of a trapezium on an appropriate shape or show an appropriate volume calculation to earn even one mark. Some used the model from part **(c)** to get the correct value but obviously this did not score.

Answer: 166

(c) Again only the very best candidates made any progress with this part. Some tried working backwards from the answer or assumed many of the steps.

(d) There were a reasonable number of attempts at the sketch graph here. Candidates would score better if they used the whole grid (as many used less than half the given width) and considered adding scales where they are not given. Putting a scale on the axes provided a communication opportunity.

(e) There were a few correct answers here but little evidence of the sketch graph being used to communicate a method.

Answer: 18.1

Question 3

(a) Only a very few could follow the whole process of changing the model here, although many scored a method mark for partially correct working.

Answer: $0.001095dw\left(300-\frac{(30-d)}{\tan 60}-\frac{30}{\tan 60}\right)$

(b) (i) Many gained a mark for a straightforward generalisation here even if they had not scored in the earlier parts.

Answer: $0.001095dw\left(300-\frac{(30-d)}{\tan\theta}-\frac{30}{\tan\theta}\right)$

(ii) There were few correct answers here with the most common answer being ‘increases’.

Answer: decreases

(iii) Only a very few candidates could consider the real-life implications of the limitations of the model.

(b) This part was not answered well, as only a few of the candidates who had a model in part **(b)** tried to use it.

Answer: 155